AORTO-ILIAC OCCLUSIVE DISEASE IN THE DIFFERENT POPULATION GROUPS — CLINICAL PATTERN, RISK PROFILE AND RESULTS OF RECONSTRUCTION

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Background. It has previously been accepted that atherosclerotic disease is uncommon among blacks worldwide; however, recent studies have increasingly reported atherosclerotic disease in this group.

Study design. Prospective study of hospital patients with aorto-iliac occlusive disease presenting to the vascular service of the Durban metropolitan hospitals. The study was designed to assess clinical pattern, risk profile and results of reconstruction in these patients.

Methods. This is a study of 688 patients with aorto-iliac occlusive disease managed over 9 years in Durban, with clinical pattern and risk factors compared in the different population groups. A subgroup of 492 patients underwent aortobifemoral bypass, providing material for comparison of the results of reconstruction in the different population groups.

Results. More black patients presented with gangrene and threatened limb, whereas whites tended to present early with claudication. All groups had hypertension and diabetes as risk factors. In addition, whites and Indians had ischaemic heart disease, which was not found among blacks.

Mortality was 5% (blacks 1.8%, whites 8.5%, Indians 5%). Medium-term occlusion rates were 19% in blacks, 13% in Indians and 5% among whites. Five-year cumulative patency rates were 92% for whites, 77% for Indians and 74% for blacks.

Conclusion. Whites do significantly better than blacks, who tend to present at an advanced stage of the disease. The presence of ischaemic heart disease among whites and Indians contributes to the higher mortality in these groups.

S Afr Med J 1999; **89:** 1288-1292.

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It is an almost universal view that peripheral arterial disease occurs rarely in the black population, with little or no mention made of the problem in various textbooks dealing with the practice of internal medicine, surgery and pathology in this population group.[1-3] In 1974 Grobelaar[4] reported that 26% of 70 black patients presenting at Kalafong Hospital (South Africa) with peripheral arterial disease were atherosclerotic. In 1985 a study by Robbs[5] involving 494 black patients from the University of Natal vascular service, demonstrated that atherosclerotic peripheral arterial disease was well established in blacks.

This study forms an ongoing audit of aorto-iliac occlusive disease in Durban and compares black, Indian and white patients, with special reference to presentation, complications and patency rates following reconstructive surgery.

PATIENTS AND METHODS

All patients presenting to the vascular service with aorto-iliac disease between 1985 and 1993 were monitored prospectively. A pro forma was completed on all patients and the information was stored in a computer database. A subgroup of these patients was deemed eligible for reconstructive surgery. This group was followed up prospectively to assess long-term outcome. The clinical profile, risk factors and results of reconstruction were documented separately for the latter subgroup.

All patients were fully evaluated clinically and then submitted to a routine investigative protocol including blood tests and non-invasive investigations such as segmental pressure measurements and velocity waveform analysis. Patients who were eligible for surgery were also submitted to angiography.

Aortobifemoral bypass was performed under controlled anaesthesia using thoracic epidural and standard general anaesthetic techniques. Systemic heparin was used routinely in a dose of 100 IU/kg. The groins were explored first to assess 'run-off' and a standard bypass procedure followed. Prophylactic antibiotics were given, and on discharge appointments were arranged at the Vascular Clinic where patients were seen at 1-month, 3-month and 6-month intervals. For the purposes of this study follow-up stopped at 5 years, and median follow-up was 28 months. The chi-square test was used for statistical analysis and life-table analysis was performed to calculate cumulative patency.

RESULTS

There was a total of 688 patients with aorto-iliac disease (301 blacks, 102 Indians and 285 whites). Their ages ranged from 26 to 89 years (mean 57.3 years), and the mean age for whites, Indians and blacks was 62.5, 55 and 54 years, respectively.

Table I. Profiles of different population groups

	Blacks	Indians	Whites
Total No.	301	102	285
Age (yrs)			
Range	26 - 79	35 - 70	38 - 89
Average	54.3	55	62.5
M/F ratio	7:1	4:1	2:1

Males predominated in both groups and the male/female ratio was highest among blacks (Table I). Of the 688 patients, 492 were eligible for reconstruction (224 blacks, 80 Indians and 188 whites). Significantly fewer white patients underwent surgery ($P < 0.05$).

Clinical presentation of the whole group and the surgery subgroup are shown in Tables II and III.

Table II. Clinical presentation of aorto-iliac disease (whole group)

	Total ($N = 688$)		Blacks ($N = 301$)		Indians ($N = 102$)		Whites ($N = 285$)	
	N	%	*N*	%	*N*	%	*N*	%
Claudication	264	38	63	21*	44	43†	157	55‡
Rest pain	128	19	45	15	21	21	62	22
Ulcer	84	12	44	15	13	13	27	9.5
Gangrene	212	31	149	50*	24	24†	39	14‡

Claudication: *v.‡ $P < 0.0001$; *v.† $P < 0.0001$; †v.‡ $P = 0.0844$.
Gangrene: *v.‡ $P < 0.0001$; *v.† $P < 0.0001$; †v.‡ $P = 0208$.

Table III. Presentation in different population groups (surgery subgroup)

	Total ($N = 492$)	Blacks ($N = 224$)		Indians ($N = 80$)		Whites ($N = 188$)		
		N	%	*N*	%	*N*	%	*P*-value
Claudication	255	79	35*	48	60	128	68†	0.0001
Rest pain	74	30	13	11	14	33	18	
Ulcer	58	38	17	8	10	12	6	
Gangrene	105	77	34†	13	16	15	8*	0.005

*v.† statistically significant.

Gangrene was significantly more common in black patients than in whites and Indians, with claudication the commonest presentation in the latter two groups. There were no significant differences between the three groups in terms of rest pain and ischaemic ulcer. There were significantly more black patients with threatened limbs (i.e. a combination of rest pain, digital gangrene and ischaemic ulcer) than Indians and whites in both groups, with a significant difference between black and white patients (Table IV). Claudication was the most common presentation for surgery among white and Indian patients ($P < 0.001$).

Table IV. Comparison of claudication and threatened limb in the different population groups

	Total	Blacks	Indians	Whites
Whole group	688	301	102	285
Claudication	264 (38%)	63 (21%)	44 (43%)	157 (55%)
Threatened limb	424 (62%)	238 (79%)	58 (57%)	128 (45%)
Surgery subgroup	492	224	80	188
Claudication	255	79 (35%)	48 (60%)	128 (68%)
Threatened limb	237	145 (65%)	32 (40%)	60 (32%)

Whole group: black v. Indian $P < 0.0001$; black v.white $P < 0.0001$; Indian v. white $P = 0.0844$.
Surgery subgroup: black v. Indian $P = 0.001$; black v. white $P = 0.001$; white v. Indian $P = 0.202$.

Operative risk factors (surgery subgroup) were assessed before surgery and are shown in Table V. It is notable that no black patient had ischaemic heart disease. The overall risk was significantly lower in blacks than in the other two groups. The overall complications occurring within 1 month of the procedure are shown in Table VI. The mortality rate was 5.1% and the causes of death, stratified according to the different population groups, are shown in Table VII. Myocardial infarction, which occurred only in whites and Indians, was responsible for 60% of deaths. The 4 deaths in the black group were associated with random organ failure. The mortality rate was 9% for whites, 5% for Indians and 1.8% for blacks. The difference in mortality between blacks and whites was statistically significant.

Table V. Risk factors in the different population groups (surgery subgroup)

	Overall	Blacks ($N = 224$)	Indians ($N = 80$)	Whites ($N = 188$)	P-value
Hypertension	127	22%	28%	30%	
Ischaemic heart disease	58	0	23%	24%	
Diabetes	48	4.5%	15%	11%	
Total risk*		25%†	50%‡	50.3%‡	< 0.0001

*Some patients had more than one risk factor.
†v.‡ statistically significant.

The median follow-up period was 28 months. Graft occlusion occurred in 65 patients (13.2%), with 13 patients (2.6%) developing graft sepsis. In 51 of the 65 patients only one graft limb was occluded, while in the remaining 14 patients the whole graft was occluded. The occlusion rate was 18.5% in blacks, 12.6% in Indians and 5.1% among whites. A statistically significant difference in occlusion was noted between black and white patients ($P = 0.0001$); there was no difference between blacks and Indians and between whites and Indians. There was no difference in graft sepsis between population

Table VI. Postoperative complications within 1 month (surgery subgroup) ($N = 492$)*

	N	%
Death	25	5.1
Remote		
Respiratory	21	4.2
Intestinal obstruction	4	0.8
Deep vein thrombosis	4	0.8
Cerebrovascular accident	2	0.4
Other	6	1.2
Local		
Wound sepsis	19†	3.9
Abdomen	9	1.8
Groin	11	2.2

*This table originally appeared in Madiba TE *et al., Br J Surg* 1997; **84**: 1416-1418, and is reproduced with permission.
†One patient had wound sepsis in both abdomen and groin.

Table VII. Causes of postoperative mortality in 25 patients within 1 month (surgery subgroup)

	Blacks	Indians	Whites	Total
Myocardial infarction	0	3 (4%)	12 (6.4%)	15 (60%)
Respiratory failure	1	0	1	2 (8%)
Renal failure	2	0	1	3 (12%)
Pulmonary embolism	0	0	1	1(4%)
Bowel infarction	1	0	1	2 (8%)
Cerebrovascular accident	0	1	0	1 (4%)
Aorto-enteric fistula	0	0	1	1(4%)
Total	4	4	17	25
Mortality rate (%)	1.8*	5†	8.5‡	5.1

‡v.* $P < 0.005$.
‡v.† NS.
†v.* NS.

groups (3.7% among black patients, 1.4% among Indians and 1.9% among whites). The 5-year cumulative patency rates, calculated by life table analysis, are depicted in Figs 1 and 2. The overall patency rate was 82% (standard error (SE) 0.04) — 74% (SE 0.01) in blacks, 77% (SE 0.05) in Indians and 92% (SE

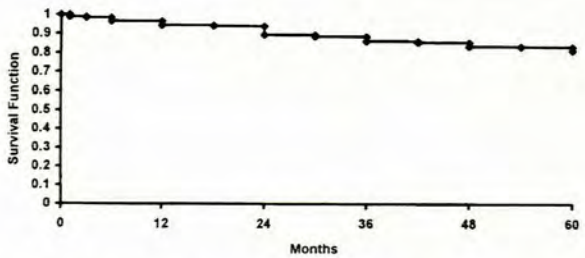

Fig. 1. Overall 5-year patency rate calculated by life-table analysis (surgery subgroup).

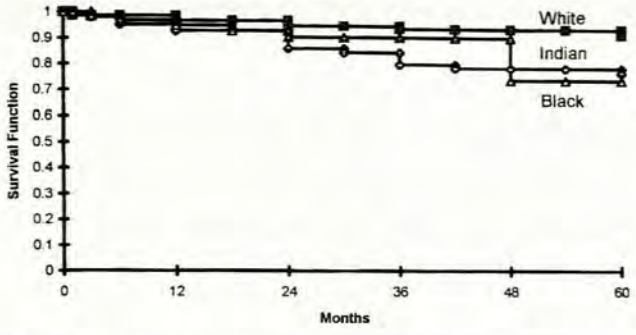

Fig. 2. Five-year patency rates for different population groups calculated by life-table analysis (surgery subgroup).

0.028) in whites. Whites fared significantly better than blacks ($P = 0.01$) and Indians ($P < 0.05$). There was no significant difference between Indians and blacks ($P = 0.7$). The chi-square method was used for statistical analysis.

Discussion

This study has confirmed that atherosclerosis and aorto-iliac disease are now established in all population groups and that black patients tend to be slightly younger and to present with more advanced disease. These are the patients who present to State hospitals. It is possible that younger white and Indian patients present to the private sector; for this reason these results may be skewed. Although it is an accepted fact that aorto-iliac disease mainly affects men,[6-9] it is of interest that the male preponderance was highest among blacks. We were not able to explain this observation.

More black patients had a threatened limb at the time of surgery compared with their Indian and white counterparts, who presented mainly with claudication. This is supported by a similar observation in two local studies.[5,10] We believe that socio-economic factors including transport from home to hospital, fear of losing a job, and possibly ignorance and stoicism, may explain the high rate of necrosis among blacks, rather than aggressiveness of the disease. There were comparatively fewer patients with advanced disease in the surgery subgroup, possibly because many patients were either too sick to undergo reconstructive procedures or presented late with unsalvageable limbs.

Hypertension was the most common risk factor in all groups. Ischaemic heart disease was commonest among whites and was not seen among blacks. These findings are supported by the work of Seftel,[11] who reported on the rarity of ischaemic heart disease in South African blacks. Why the disease affects coronary vessels less frequently in blacks remains enigmatic. In the study by Robbs[5] plasma levels of triglyceride, cholesterol and high-density lipoproteins were found to be low in blacks. The significance of this, however, was not apparent in that study as the sample size was small. Robbs[5] also reported a higher incidence of arteritis and a lower incidence of aneurysmal disease in black patients.

Total risk was lower for blacks than for Indians and whites. This is probably related to the higher incidence of risk factors among the latter two groups, such as diabetes among Indians and ischaemic heart disease among whites. It is of interest that in this study Indian patients were found to have a lower risk of coronary heart disease than in the study by Seedat *et al.*,[12] who demonstrated that 47% of Indians in Durban had an abnormal ECG denoting coronary heart disease. It is tempting to speculate from this study that simultaneous occurrence of coronary heart disease and limb disease is uncommon. Another study by the same group[13] showed that personal factors such as hypertension, hypercholesterolaemia and smoking were major risk factors for coronary heart disease among whites.

The mortality rate of 5% in this series falls within the reported mortality rate figure of 2 - 9%.[7,14-17] Most patients, mainly Indians and whites, died as a result of myocardial infarction, with the highest mortality among whites. A likely reason is that most of these patients were inadequately investigated with regard to cardiac risk owing to the urgency of limb revascularisation, which was often performed on a semi-emergency basis, as well as inability to perform treadmill stress testing because of limb pain. We have adopted the cardiac risk index as described by Goldman *et al.*[18] to predict operative risk. Local studies[19,20] have demonstrated that this index is reliable in predicting operative risk. In more recent times dipyridamole-thallium perfusion scans have improved this assessment.[21]

The 5-year patency rate of 82% is in keeping with that reported in the literature (75 - 95%).[5-7,15] White patients demonstrated the highest patency rate. We have shown previously that patients with threatened limbs fare worse than claudicants;[22] the low patency rate among blacks in this series may be attributed to this.

We reaffirm the occurrence of atherosclerosis, including aorto-iliac disease, in blacks as well as in other population groups, with hospital prevalence remaining highest among whites. Black patients tend to present at a far-advanced stage of the disease compared with other population groups. Ischaemic heart disease is most common among whites and contributes to the higher mortality due to myocardial infarction. Whites achieve higher patency rates than blacks and Indians.

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Accepted 4 Jan 1999.