1998 SURVEY OF CARDIAC PACING IN SOUTH AFRICA — REPORT OF THE WORKING GROUP ON REGISTRIES OF THE CARDIAC ARRHYTHMIA SOCIETY OF SOUTH AFRICA (CASSA)

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Background. Permanent pacemakers provide effective relief of symptoms and are life-saving in patients with symptomatic heart block. Since pacemakers are only implanted by cardiologists or cardiothoracic surgeons in tertiary hospitals, the rates of pacemaker implantation provide a readily auditable measure of tertiary health care.

Methods. A survey was conducted of pacemaker implantation in South Africa in 1998, using questionnaires completed by implanters and information on the total number of pacemakers sold during the period, supplied by pacemaker distributors.

Results. A total of 1 643 new pacemakers were implanted in 1998 by 112 doctors working in 31 institutions (9 public and 22 private). The annual implant rate per million population was 39, compared with 31/million in 1995, an increase of 25.8%. Public hospitals accounted for 31.7% of primary pacemaker implants in 1998 as opposed to 37% in 1995. Practice in the public sector differed from that in the private sector in that atrioventricular (AV) block was the major indication for pacing in 75.3% versus 45.3%, whereas sinus node dysfunction accounted for 34.9% of private patients, as opposed to 16.2% of public hospital patients. Simple VVI single-chamber pacemakers accounted for 49.5% of public hospital implants versus only 9.6% in private patients. The reverse was true for dual-chamber implants (12.1% v. 42.3%).

Severe cost constraints in the public sector have resulted in increasing use of cheaper single-chamber pacemakers for more stringent indications (predominantly AV block).

The overall implant rate remains low compared with a median of 283/million in Europe. Large discrepancies persist between race groups (232/million whites, as opposed to 8.8/million blacks) and regions (89.3/million in the Western Cape versus 10.8/million in the four provinces without pacemaker implanters).

Conclusion. It is likely that socio-economic factors play a major role in the unequal distribution of this highly effective treatment for potentially lethal bradyarrhythmias. The changing trends in pacemaker implantations indicate a shift of tertiary health care resources from the public to the private sectors.

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Symptomatic heart block is a highly lethal condition and can cause major disability. The only effective treatment is implantation of a pacemaker, which markedly improves the quality of life and life expectancy. It also provides excellent symptomatic relief for less life-threatening bradyarrhythmias, such as sinus node dysfunction. Pacemakers are only implanted in tertiary hospitals by cardiologists and occasionally by cardiothoracic surgeons. Pacemaker implantation is therefore a readily auditable measure of delivery of effective tertiary health care. We believe this to be of value not only to cardiologists, but also to health administrators and others concerned with the delivery of health care.

The aim of this survey was to document the practice of cardiac pacing in South Africa in 1998, and to compare it with the last survey conducted in 1995[1] and with international experience.

METHODS

The same questionnaire used for the 1995 survey was sent to all practitioners identified as actual or potential pacemaker implanters. Sales figures, provided by the main suppliers of pacemakers in South Africa, formed the denominator for the respondents' data. Population data were obtained from the 1996 census[2] and adjusted for 1998.[3] Estimates of primary pacemaker implantation rates for the population as a whole, the nine provinces, and for the different race groups were derived from these data. The different patterns of pacing practice in the public and private sectors were compared.

RESULTS

Pacemaker implanters

The industry survey suggested that a total of 112 doctors in 31 institutions implanted pacemakers in 1998. Thirty-eight completed questionnaires were received, representing 35 private implanters from 22 institutions and more than 20 implanters from 8 public institutions. The responders provided

details for 1 167 out of an estimated total of 1 645 primary pacemaker implants performed in 1998 (71%).

Private versus public implanters (Table I)

A total of 522 primary pacemaker implants took place in public hospitals (31.7%), whereas the majority of 1 123 (68.3%) were performed privately. The present survey records a small increase (9.9%) in number of public hospital implants (from 475 to 522), whereas the number of private implants has increased by 40.4% from 800 to 1 123. This increase in private sector implants accompanies an increase in number of private implanters and institutions, whereas the number of public hospitals implanting pacemakers has not changed. The racial distribution of patients in the private sector (88.3% white) contrasts with the public sector (36.8% black, 28.6% white). However, the age distribution was similar.

Distribution of implanters

As in the previous survey, the majority of implanters are in Gauteng (65/112, 58%) and the Western Cape (21/112, 18.8%). There were no pacemaker implanters in four provinces (Northern Cape, North West, Northern Province and Mpumalanga) with a total population of 12.45 million.

Primary pacemaker implant rates

The overall primary implant rate has increased from 31/million in 1995 to 39/million in 1998 (25.8%). However, the marked discrepancy in implant rates between the races persists (Table II), ranging from 8.8/million among blacks to 232/million for whites. Marked geographical variations in implant rates were present, from 89.3/million in the Western Cape to 10.8/million in the four provinces without facilities for pacemaker implantation.

Indications for pacing (Table III)

Disorders of atrioventricular (AV) conduction remain the predominant indication for pacing in South Africa overall (58.1%), but constitute 75.3% of implants in public hospitals versus only 45.3% in private hospitals. Sinus node dysfunction accounts for a much higher proportion of implants in private patients than in public hospital patients (34.9% v. 16.2%).

Table II. Regional and racial variation in implant rates

	Estimated population 1998 (million)	Estimated pacemaker implant rate per million/year
Region		
South Africa	42.13	39
Western Cape	4.09	89.3
Gauteng	7.63	57.5
KwaZulu-Natal	8.73	27.4
Free State	2.73	24.9
Eastern Cape	6.52	15.8
Rest of South Africa	12.45	10.8
Race		
White	4.5	232
Asian	1.1	92
Coloured	3.8	53.9
Black	32.4	8.8
Gauteng black	5.3	15.1
Western Cape black	0.9	16.3

Type of pacemaker implanted (Table III)

Similar differences exist between the public and private sectors in the choice of pacing system. Simple single-chamber VVI pacemakers account for nearly half the public sector implants versus only 9.6% of private implants. The reverse is true for the most sophisticated dual-chamber pacemakers (DDD and DDDR), which account for 42.3% of implants among private patients compared with only 12.1% in public hospital patients.

Discussion

Status of pacing in South Africa

There was an increase in the overall number of pacemakers implanted in 1998 compared with 1995.[1] However, the overall implantation rate of 39/million remains low compared with developed countries. The median implantation rate in Europe was 283/million in 1996.[4]

Most of the growth since the last survey has been in privately funded pacemaker implants. This may, in part, be due to the increased numbers of private institutions and implanting cardiologists in private practice.

Table I. New pacemaker implantations in South Africa, 1995 and 1998

	Institutions		Implanters		New pacemaker implants		
Year	Public	Private	Public	Private	Public (%)	Private (%)	Total (%)
1995	9	21	23	52	475 (37)	800 (63)	1 275
1998	9	22	23	89	522 (31.8)	1 123 (68.3)	1 643 (+28.8)

Table III. Differences between public and private hospitals

	Public hospitals		Private hospitals	
	1995	1998	1995	1998
Race of recipient (%)				
Black	34.3	36.8	1.5	4.1
White	42.1	28.6	94.5	88.3
Coloured	14.8	24.2	0	4.5
Asian	8.9	10.4	4.1	3.1
Indication for pacing (%)				
AV block	63.8	75.3	48.7	45.3
Sinus node dysfunction	29.2	16.2	38.5	34.9
AV node ablation	—	3.0	—	13.6
Other	7.2	6.3	12.8	7.6
Pacemaker type (%)				
AAI/R	—	0.4	—	1.2
VVI	35.0	49.8	19.6	9.6
VVIR	21.5	23.2	23.7	34.9
VDD	14.8	14.5	17.1	10.9
DDD/R	26.3	12.1	38.3	42.3

Demographics of pacemaker recipients

The discrepancies in distribution of pacemaker implants both geographically and among the different race groups, which were noted in the previous survey,[1] persisted in 1998.

The relatively high implant rate of 232/million among white South Africans (Table II) is comparable to that in Europe,[4] whereas the low rate of 8.8/million among black South Africans is similar to that in certain other developing countries.[5] However, the implantation rate among Asian South Africans decreased from 219/million in 1995 to 92/million in 1998, whereas that among coloured South Africans increased from 16 to 56.9/million. These differences are unexplained. A small part of this discrepancy may be due to different age structures of the majority black population. Only 19.7% of blacks versus 38.5% of whites are over the age of 40 years, with 95% of pacemaker implantations occurring in this older age group. It is not known whether there are significant differences in the incidence of conduction disturbances between blacks and whites leading to pacemaker implantation. However, the differences in regional implantation rates (Table II) for all races suggest that access to sophisticated medical facilities is an important factor.

It is not clear from the survey how many South Africans needing a pacemaker do not receive one. Pacemakers were implanted in 661 (23.4/million) South Africans in 1998 for symptomatic AV block (the most compelling indication), whereas the average in Europe in 1996 was 112/million/year. If the incidence of AV block is similar to that in Europe, then up to 3 700 patients/year in South Africa may have AV block without a pacemaker.

While symptomatic bradycardias requiring pacing may form a small part of our overall public health problem, the procedure has a profound effect on both life expectancy and quality of life of affected individuals. It is one of the most cost-effective treatments available in modern medicine.[6] A patient with complete heart block who does not have access to pacing will either die suddenly, face repeated episodes of syncope, or be disabled by heart failure.

Indications for pacing

The preponderance of patients with AV block among those receiving pacemakers in the public sector (75.3%) contrasts with a relatively high proportion of private patients paced for sick sinus syndrome (34.9%). The latter proportion is characteristic of trends in the developed world, whereas high levels of AV block as an indication suggest restricted access to pacing.[7] The increasing proportion of patients with AV block in public hospitals compared with the last survey (75.3% v. 63.8%) suggests a narrowing of indications to those with the most pressing need.

Types of pacemaker

Public hospitals operate under severe budgetary constraints, reflected in the much more frequent use of simple VVI pacemakers, which are implanted in a small minority of private patients. There has been a shift towards more VVI pacemakers in the public sector since 1995, at the expense of dual-chamber systems, whereas fewer VVI pacemakers have been implanted privately, largely replaced by single-chamber rate-responsive VVIR units. The private sector implants a much higher

proportion of sophisticated dual-chamber pacemakers (DDD and DDDR). The single-pass VDD system, which preserves AV synchrony by sensing atrial activity without providing atrial pacing, is somewhat more popular in the public sector, probably because it provides a good compromise between performance and cost in patients with AV block. Private practice resembles that in developed countries in the pattern of pacemaker usage.

CONCLUSIONS

Racial differences in the rate of pacemaker implantations are still marked. While the incidence of conduction disturbances in blacks compared with whites is not known, the tendency towards higher pacemaker implant rates among blacks who have medical insurance and those living in the Western Cape and Gauteng, suggests that socio-economic factors play a role.

This survey reveals a shift of tertiary care from the public to the private sector, which is likely also to be taking place in fields outside of cardiology and pacemaker implantation. The latter, however, provides an easily auditable measure of this shift.

Whereas in the past academic hospitals were in the forefront of provision of newer and more sophisticated treatment, this role is being taken over by private medicine. This is a result of movement of skilled personnel into private practice, coupled with economic strangulation of academic hospitals. The majority of the population, mainly black, who do not have medical insurance, rely on the shrinking public sector for high quality tertiary health care.

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