Medicine in the Elderly

Permanent pacemakers in nonagenarians

J.E. Elizabeth and G.J. Green

Ysbyty Glan Clwyd, Glan Clwyd Hospital, Bodelwyddan, Nr Rhyl, Clwyd LL18 5UJ, UK

Summary: We report our experience of 20 patients who have had permanent pacemakers implanted for the first time after the age of 90. The main indications were syncope or presyncope which occurred in 15 patients. Complete heart block was present in 14 patients. Syncopal and presyncopal symptoms were cured in 73%. Nonagenarians paced for complete heart block can expect to survive for as long as others of the same age without heart block. Permanent pacing is an effective and appropriate treatment in the very old.

Introduction

With ageing, the conduction system of the heart becomes fibrotic,¹ the sinus node loses some of its pacemaker cells^{2,3} and both the sinus and atrioventricular nodes are infiltrated with fatty and collagenous tissue,^{1,4} changes which may lead to sinus node dysfunction and heart block which are the most common reasons for permanent pacemaker implantation. Sinus node disorder in the elderly is most commonly related to a sclerotic, degenerative process;^{1,2} other causes being chronic ischaemic heart disease,⁵ drugs and infiltrative disorders.⁶ Chronic atrioventricular block with no overt systemic disease is most likely to be due to idiopathic bundle branch fibrosis a condition which has been described as a combination of age changes and 'wear and tear'.⁷ Destruction of the conduction system related to coronary atheroma, cardiomyopathy⁸ and extensive calcification around the aortic valve and mitral valve ring^{1,9} can all cause atrioventricular block in the elderly. Patients with HLA B27 related connective tissue disease may have the atrioventricular node involved in the inflammatory process.^{10,11} The prevalence of HLA B27 is significantly increased in patients with complete heart block who do not have clinical or radiological evidence of a seronegative arthritis.¹² HLA B27-associated syndromes have been detected in a group of patients undergoing permanent pacemaker treatment,¹³ but those studied did not include females and few were older than 90 years of age.

Many elderly people have permanent pacemakers;^{14–18} however, the number of nonagenarians in these studies is small. We report our experience of 20 patients who were 90 years or more at the time of initial permanent pacemaker implantation. These nonagenarians were derived from 530 patients attending a follow-up Pacemaker Clinic between 1983 and July 1990.

Methods and results

The notes of all these patients were reviewed with regard to age, symptoms and functional status (mobility, mental state, independence) at the time of pacemaker implantation. A previous history of angina and heart attack was noted. In some instances features of functional status were not fully recorded and analysis of all 20 patients was, therefore, incomplete.

There were 14 females (70%). The mean age at initial insertion of the pacemaker was 92.2 (range 90–97) years. Fifteen patients were between the age of 90–94 and 5 were 95 years old or more, with 2 females aged 97.

Fifteen were mobile and 14 were alert. Two were chronically confused. Eight lived alone, 5 lived with somebody (4 children, 1 spouse), 3 lived in warden controlled accommodation and 4 were in private nursing homes (1 in a home for the elderly mentally infirm). Fourteen were self-caring with minimal support either from relatives or social services.

Clinical and electrocardiographic indications for permanent pacing are shown in Table I. Only one patient had a pacemaker for prophylactic reasons. This was a 97 year old female with fractured femur who was found to have intermittent complete heart block and 2:1 atrioventricular block on a preoper-

Table 1 Clinical and electrocardiographic indications for permanent pacemakers

<i>Indications for pacing</i>	<i>Number of patients</i>
<i>Clinical</i>	
Syncope	8
Presyncope	7
Fatigue	3
Cerebral dysfunction	2
Prophylactic	1
<i>Electrocardiographic</i>	
Complete heart block (wide QRS)	7
Complete heart block (narrow QRS)	7
Sick sinus syndrome	3
Second degree heart block (Mobitz Type 2)	1
Right bundle branch block/left anterior hemiblock/first degree heart block	1
Carotid sinus hypersensitivity	1

ative electrocardiograph (ECG). She denied pre-syncope or syncopal symptoms, and was alert, mobile and not on any medication. Standard 12 lead ECG confirmed the diagnosis in all patients; however, two (10%) needed in-hospital 24-hour telemetry to confirm that symptoms were related to the rhythm abnormality. Six patients required a temporary pacing wire (for a mean of 10 days) before permanent pacing could be arranged and 3 had been on isoprenaline tablets before admission. Only 5 patients (25%) had a history of ischaemic heart disease (angina or previous myocardial infarction). A 96 year old female developed persistent complete heart block following a myocardial infarction.

Nineteen (95%) patients had single chamber (ventricular) VVI pacemakers. The only patient to have a dual chamber (DDD) pacemaker was an alert, 91 year old independent female with complete heart block who had the implantation at the end of 1989.

There were no complications from the procedure. At least 11 (73%) out of the 15 patients with presyncope or syncopal symptoms had no further attacks. There was no record of the effect of pacing on the 4 other patients with presyncope or syncope. Fatigue was alleviated in all 3 patients with this symptom. Seven patients (54%) who were living in the community at the time of having their pacemakers had moved to nursing home accommodation within 15 months. Eighty-five per cent of patients were alive one year after implantation of the pacemaker and this percentage decreased to 70, 55, 50 and 45 at the end of the second, third, fifth and sixth year respectively. Eleven patients had died at the time of writing the report. The shortest

survival time after pacing was 2 months and this was a 94 year old female who died of pneumonia. Patients with previous ischaemic heart disease had a mean survival of 20.5 (range 10–36) months compared to 30 (range 2–72) months for patients without ischaemic heart disease. Cause of death in the group with ischaemic heart disease (5 patients) was heart failure (3 patients with complete heart block), bronchopneumonia (1 patient with complete heart block), and stroke (patient with right bundle branch block/left anterior heart block/first degree heart block). Stroke (3 patients: 2 complete heart block; 1 sick sinus syndrome), bronchopneumonia (1 patient with complete heart block), carcinoma of rectum (1 patient with complete heart block) and hepatorenal failure (patient with Mobitz Type II second degree heart block) were the causes of death in the rest.

The survivors have had their pacemakers for a mean of 39.9 (range 6–84) months. The longest survivor post-pacing is a 97 year old who still lives at home with her daughter. Only 2 patients have needed a change of generator so far. This was 4 and 5 years after implantation. The reason in both cases was end of life characteristics of the pulse generator.

Discussion

In all patients there was documentation of a definite indication for a pacemaker. The majority had complete heart block with only 3 (15%) having a sick sinus syndrome, a lower incidence than is expected in a pacemaker population,¹⁹ but the same as reported elsewhere for the very elderly.²⁰ In our group, relief of symptoms is as rewarding as with younger patients, particularly so for patients presenting with syncopal or presyncope symptoms.

Nearly all patients had single chamber (ventricular) pacemakers, a decision that was influenced by the cost and size of the unit, the short survival time anticipated for these elderly patients and the time span during which implantation took place. Older patients with symptomatic bradycardia caused by atrioventricular block may benefit from physiological pacing^{21,22} which has been shown to be superior to ventricular demand pacing in giving a greater effort tolerance, an improvement in the patients overall feelings of well being^{23,24} and better control of blood pressure with fewer episodes of hypertension.²⁵ Physiological pacing for the elderly will undoubtedly be given greater consideration in the future although our patients had good symptomatic improvement with single chamber units.

A first year mortality, after pacing, of 15% is less than that reported elsewhere¹⁸ but survival afterwards is at least the same as that of the general population. Patients in their eighties paced for

complete heart block can expect to survive as long as others of the same age and sex without heart block.²⁶ Our results suggest that this is so for nonagenarians paced for complete heart block as well. As previously reported,^{26,27} a history of ischaemic heart disease is important in determining survival after pacing for complete heart block.

Our results show that significant benefit can be experienced by very old people from permanent cardiac pacing from the abolition of symptoms due

to bradycardia. The fact that the majority of the patients have lived relatively healthy lives for considerable periods after pacing justifies the investigation and treatment of bradyarrhythmias in the very old.

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References

1. Davies, M.J. Pathology of the conduction system. In: Caird, F.I., Dall, J.L.C. & Kennedy, R.D. (eds) *Cardiology in Old Age*. Plenum Press, New York, 1976, pp. 57–80.
2. Davies, M.J. & Pomerance, A. Quantitative study of ageing changes in human sinoatrial nodes and interatrial tracts. *Br Heart J* 1972, **34**: 150–152.
3. Thery, C., Cosselin, B., Le Kieffre, J. & Warembourg, H. Pathology of sinoatrial node: Correlations with electrocardiographic findings in 111 patients. *Am Heart J* 1977, **93**: 735–740.
4. Demoulin, J.C. & Kulbertus, H.E. Histopathological correlates of sinoatrial disease. *Br Heart J* 1978, **40**: 1384–1389.
5. Shaw, D.B., Linker, N.J., Heaver, P.A. & Evans, R. Chronic sinoatrial disorder (Sick Sinus Syndrome): a possible result of cardiac ischaemia. *Br Heart J* 1987, **58**: 598–607.
6. Rodriguez, R.D. & Schoken, D.D. Update on sick sinus syndrome, a cardiac disorder of ageing. *Geriatrics* 1990, **45**: 26–36.
7. Lev, M. The pathology of complete atrioventricular block. *Prog Cardiovasc Dis* 1964, **6**: 317–326.
8. Harris, A., Davies, M., Redwood, B., Leatham, A. & Siddons, H. Aetiology of chronic heart block a clinicopathological correlation in 65 cases. *Br Heart J* 1969, **31**: 206–218.
9. Paulsen, S. & Vetner, M. Rytand-Lipsitch syndrome. *Arch Pathol* 1975, **99**: 246–248.
10. Davies, M.J. Disorders of the conduction system. In: Ansell, B.M. & Simkin, P.A. (eds) *The Heart and Rheumatic Disease*. Butterworths, London, 1984, p. 65.
11. Bergfeldt, L., Edhag, O., Vedin, L. & Vallin, H. Ankylosing spondylitis: an important cause of severe disturbances of the cardiac conduction system. *Am J Med* 1982, **73**: 187–191.
12. Bergfeldt, L. & Moller, E. Complete heart block – another HLA B27 associated disease manifestation. *Tissue Antigens* 1983, **21**: 385–390.
13. Bergfeldt, L. HLA B27-associated rheumatic disease with severe cardiac bradyarrhythmias. Clinical features and prevalence in 223 permanently paced men. *Am J Med* 1983, **75**: 210–215.
14. Colokathis, B., Lampesis, P.T. & Molari, V.J. Pacemaker in a 92 year old patient (letter). *JAMA* 1971, **207**: 80.
15. Jeresaty, R.M., Liss, J.P., Basu, S.K. & Knight, H.F. Cardiac pacing in the elderly (letter). *JAMA* 1972, **219**: 1338.
16. Strauss, H.D. & Berman, N.D. Permanent pacing in the elderly. *PACE* 1978, **1**: 458.
17. Breivik, K. & Ohm, O.J. Improved quality of life from pacemaker treatment in the very aged. In: Gomez, P.F. (ed.) *Cardiac Pacing*. Futura Media Services, New York, 1985, p. 1207.
18. Michel, B., Fischer, A.P., Stumpe, F., Sadegli, H. & Kapfenberger, L. Cardiac stimulation in patients older than 80 years. *PACE* 1987, **10**: 445.
19. Feruglio, G.A. World survey on cardiac pacing. *PACE* 1983, **6**: A157–A172.
20. Handler, C.E. & Holt, P.M. Why pace the elderly? *Br Heart J* 1987, **57**: 75P.
21. Kay, H.R., Armenti, F.R. & Parr, G.V.S. Results to expect in today's older and sicker cardiac patients. *Geriatrics* 1989, **44**: 67–70.
22. Geddes, J.S. 'Physiological' pacing. *Br Heart J* 1983, **50**: 109–111.
23. Perrins, E.J., Morley, C.A., Chan, S.L. & Sutton, R. Randomised controlled trial of physiological and ventricular pacing. *Br Heart J* 1983, **50**: 112–117.
24. Kristensson, B.E., Arnman, K., Smedgard, P. & Ryden, L. Physiological versus single rate ventricular pacing: a double blind cross-over study. *PACE* 1985, **8**: 73–84.
25. Boon, N.A., Frew, A.J., Johnston, J.A. & Cobbe, S.M. A comparison of symptoms and intra-arterial ambulatory blood pressure during long term dual chamber atrioventricular synchronous (DDD) and ventricular demand (VVI) pacing. *Br Heart J* 1987, **58**: 34–39.
26. Ginks, W., Leatham, A. & Siddons, H. Prognosis of patients paced for chronic atrioventricular block. *Br Heart J* 1979, **41**: 633–636.
27. Fitzgerald, W.R., Graham, I.M., Cole, T. & Evans, D.W. Age, sex and ischaemic heart disease as prognostic indicators in long term cardiac pacing. *Br Heart J* 1979, **42**: 57–60.