ORIGINAL ARTICLES

Permanent pacemaker insertion in a district general hospital: indications, patient characteristics, and complications

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Abstract

This report reviews the experience of permanent pacemaker insertion in a district general hospital (catchment population of 350 000) and makes a comparison with the national database and other hospitals in the UK.

Methods—The records of all patients receiving a permanent pacemaker in the inclusive period January 1996 to December 1998 were reviewed. Data collected included number of patients paced each year, age, sex, indications, and complications.

Results—In the three years reviewed 200 patients received new permanent pacemakers, a rate of 190 per million population per year, which is similar to the national implantation rate of permanent pacemakers but lower than that of most European countries (see discussion). The majority of patients paced were elderly (75% were above the age of 70 years).

Atrioventricular block (including complete heart block, 45%, and Mobitz type 2 block, 12.5%) was the commonest indication for permanent pacemaker insertion, followed by sick sinus syndrome (25%) and these findings are comparable to those reported previously. However, carotid sinus syndrome was responsible for 16% of the patients paced and this was higher than that reported in the national database (6.5%). Only 1% of the pacemaker modes used was inappropriate and the complication rate was low at 3%.

Conclusions—This report confirms that permanent pacemaker insertion can be effectively and safely provided locally for the increasingly ageing population. The implantation rate both locally and nationally is still much lower than that of some countries in Europe.

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number of elderly patients is increasing and it is more convenient for this service to be provided locally. In this study a three year experience of a district general hospital serving a population of 350 000 is reported.

The aim of this study was to report a district general hospital experience in performing permanent pacemaker insertion and to compare it with that reported from a similar population and that of the national database.

Methods

The records of the patients who had had permanent pacemakers in the inclusive period of January 1996 to December 1998 were reviewed.

The permanent pacemaker insertion was performed in the cardiac catheter laboratory by one of two teams: each comprised a consultant cardiologist, a specialist registrar, a cardiac technician, a cardiac nurse, and a radiographer.

Prophylactic antibiotics (flucloxacillin 1 g or clindamycin 600 mg) were given intravenously routinely before permanent pacemaker insertion and continued orally (flucloxacillin 500 mg four times a day or clindamycin 300 mg four times a day) for 48 hours afterwards. The procedure was performed under local anaesthetic. The subclavian vein route was used for pacemaker insertion in most patients but one of the consultants used the cephalic vein if it was appropriate. Chest radiography was performed and the pacemaker was checked before discharge from hospital. Subsequent follow up was technician based with input from doctors when required.

Results

NUMBER AND CHARACTERISTICS OF PATIENTS PACED

In the 36 months studied, 200 patients with an age range of 31–95 years (75% of patients were more than 70 years old) were paced. Of these 107 (53.5%) were males (age range 52–95 years). The overall implantation rate was 190 per million population per year.

INDICATIONS FOR PACING AND THE MODES USED

Appendix 1 explains the five letter code description of the pacemaker mode adopted by North American and British Group and appendix 2 describes the general guidelines and principles used for permanent pacemaker insertion.

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In 1987 the working group of the British Cardiac Society endorsed the view that permanent cardiac pacing can be effectively performed in district general hospitals¹; by 1992 one third of hospitals in the UK provided this service.² This is becoming more important nowadays as the

Table 1 Pacemaker modes used compared with those recommended by the British Pacing and Electrophysiology Group⁴

Common indications	Modes used and number	Optimal modes recommended	Alternative modes	Inappropriate modes
CAVB and Mobitz type 2	DDD = 113 VVI = 2	DDD	VDD	AAI DDI
SSS without AVB	AAIR = 9 AAI = 12	AAIR	AAI	VVI VDD
SSS with AVB	DDD = 22 DDDR = 3 DDI = 2 VVI = 2	DDDR DDIR	DDD DDI	AAI VVI
CSS	DDI = 17 DDD = 12 VVI = 1 DDDR = 2	DDI	DDD VVI	AAI VDD

NB. The optimal mode of pacing should be considered for most patients. The alternative mode is acceptable for patients who have intermittent symptoms or who have a short life expectancy because of another disease.⁴

AVB = atrioventricular block; CAVB = complete atrioventricular block; CSS = carotid sinus syndrome; SSS = sick sinus syndrome.

The total number of patients in this table is 197. The details of the three others were not known.

Complete atrioventricular block was the commonest (90 patients; 45%) indication for permanent pacemaker insertion followed by sick sinus syndrome (50 patients; 25%), carotid sinus syndrome (32 patients; 16%) and Mobitz type 2 (25; 12.5%).

Table 1 shows the modes used compared with the modes currently recommended by the task force of the American College of Cardiology and American Heart Association³ and adopted by British Pacing and Electrophysiology Group (BPEG).⁴ Of the 115 patients who had atrioventricular block (complete heart block and Mobitz type 2 block), 113 had DDD pacing (optimal) and none had an inappropriate mode. None of the 32 patients who had carotid sinus syndrome had an inappropriate moding system but two of the 50 patients who had sick sinus syndrome had VVI modes (inappropriate according the guidelines of BPEG⁴).

COMPLICATIONS

Major complications occurred in six (3%) patients. These include leads displacement (four patients: three atrial leads and one ventricular lead), and wound infection which needed replacement of the pacemaker (two patients). Minor complications occurred in three patients (one patient developed small pocket haematoma within 24 hour of the procedure and further two developed a superficial wound infection that responded to antibiotics. No mortality occurred as a result of the procedures.

Discussion

This study showed that a consultant based permanent pacemaker service can be run effectively and safely in a district general hospital. Setting up such a service requires a cardiologist with good experience in dual chamber pacing and at least one highly qualified and motivated cardiac technician able to supervise the follow up and able to train other members of the team.

The implantation rate in this district general hospital was 190 per million of population per annum, which is similar to that of the UK generally (less than 200 per million of the popula-

tion per annum⁵). However, this implantation rate is much less than that of Germany and Belgium, which is 450 and 600 per million respectively.⁵ The low implantation rate in this country is best explained by a more conservative approach to pacing in the UK.⁶

In this report 75% of the patients paced were more than 70 years old, similar to the age distribution in the UK (73% of pacemaker implants are in the over 70s⁷). Elderly patients have been shown to have the same benefit for pacemaker implantation (for example, time to ascend stairs) as has been shown in younger patients.⁸ There has been concern in terms of modes of pacing used in the elderly in the past: it was suggested that the elderly were given less complex pacing systems than younger patients and this has lead to allegations of ageism.⁹ In this report there is no evidence that the elderly were given a less complex system (see below).

Permanent pacing for complete atrioventricular block was the commonest indication in this study (45%) and it was comparable (42%) to that reported from a similar population.¹⁰ Untreated complete heart block has a one year and five year mortality of 50% and 75%–90% respectively^{11,12}; while survival is 70%–85% at five years in those paced.¹²

Sick sinus syndrome was responsible for 25% of patients paced in this report and it was identical to that reported from a similar district general population.¹⁰ Pacing for sick sinus syndrome is based on the association of symptoms with specific dysrhythmia⁵; it effectively relieves bradycardic symptoms and can facilitate more aggressive drug treatment of tachyarrhythmias,¹³ but there is no evidence that pacing asymptomatic patients improves prognosis.¹⁴

Carotid sinus syndrome (asystole of three seconds or more with/without hypotension after carotid sinus massage in patients with syncope and/or falls) was responsible for 16% of patients paced in this study. This is higher than that reported nationally (6.4%)¹⁵—probably because there is an active tilt testing service in our hospital—but lower than centres with a dedicated “syncope clinic” (23.2%).¹⁵

Table 1 showed that 142 patients (71%) were paced with the optimal recommended mode and only two (1%) patients received inappropriate modes. Both patients were diagnosed to have sick sinus syndrome and they were paced with VVI modes.

Though it was not clear from the records why one of these patients received an inappropriate mode, the other patient had muscular dystrophy, which probably explains the choice of a simple moding system.

Thirty one of the 32 patients paced for carotid sinus syndrome received dual chamber pacing system as this was shown unequivocally to be superior to ventricular pacing.¹⁶

The major complications rate (3%) was low and was comparable to that reported (2.48%) from a district general hospital¹⁷ and similar to that reported (2.8%) from a tertiary centre.¹⁸ Pacemaker implantation in a district general hospital reduces in-hospital stay and reduces

the time spent with a temporary pacing system which increases the risk of septicaemia. It also reduces the need for elderly patients and relatives to travel great distances for follow up.

Summary

This report confirms the feasibility of permanent pacemaker insertion effectively in a district general hospital with a low incidence of complications. It also confirms that appropriate pacing modes can effectively be selected in this setting.

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Appendix 1

NASPE/BPEG PACEMAKER GENERIC CODE¹⁹

Examples: AAI, VVI, DDDR

- First letter signifies the chamber(s) being paced:
A (atrium)
V (ventricle)
D (atrium and ventricle)
- Second letter indicates the chamber(s) being sensed:
A (atrium)
V (ventricle)
D (atrium and ventricle)
- Third letter indicates the mode of sensing:
I (inhibited)
T (triggered)
D (inhibited and triggered)
- Fourth letter indicates rate responsiveness:
O (none)
R (rate responsiveness).
- Fifth letter indicates:
Antitachycardiac device

Appendix 2

GUIDELINES AND GENERAL PRINCIPLES FOR PERMANENT PACEMAKER INSERTION⁴

(A) Guidelines

Patients considered for pacing are divided into three groups:

- Class 1: Conditions in which there is general agreement that pacemakers should be implanted—syncopal patients with complete heart block or prolonged sinus arrest.
- Class 2: Conditions in which permanent pacemakers are frequently used but there is some divergence of opinion about whether they are needed—sick sinus syndrome without syncope but with other symptoms.
- Class 3: Conditions in which there is general agreement that pacemaker are not needed—asymptomatic patients with sinus node disease or first degree atrioventricular block and unexplained syncope without obvious cardiac arrhythmia.

(B) General principles for pacemaker choice

- (1) The ventricle should be paced if there is actual or threatened AB block.
- (2) The atrium should be paced/sensed unless contraindicated.
- (3) Rate response is not essential if the patient is inactive or has a normal chronotropic response.