Correcting a block?: successful experience of a small British pacing centre

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SUMMARY The establishment of a local permanent pacemaker service in a district general hospital increased the pacemaker implantation rate from 22 per million population per year to 152 per million population per year over the first 6 years of the service. Forty eight per cent of patients were referred by general practitioners and 52% by hospital specialists. Single chamber demand pacing (VVI) was used exclusively. Indications for pacing and complications were comparable to those of specialist cardiac centres.

Management of symptomatic bradycardia by cardiac pacing in the United Kingdom may be facilitated by further development of small pacing centres.

The insertion of cardiac pacemakers and the supervision of patients with pacemakers in the United Kingdom has traditionally been the province of teaching hospitals. In 1984, in a review entitled "Where's the Block?", Rickards observed that the rate of pacemaker insertion in the United Kingdom, although increasing, is substantially lower than in Europe or the United States. The establishment of additional pacing centres, each serving a smaller catchment area, may improve the accessibility of this mode of treatment to the predominantly elderly population in whom it is indicated.

This paper describes a pacemaker service based on a district general hospital. The limitations and potential of the service are discussed and the first hundred patients treated are reviewed.

Patients and methods

DEMOGRAPHIC DATA Raigmore is a district general hospital of 633 beds serving a population of 199,000 spread over an area of 9805 square miles. Before 1978, patients in whom insertion of a permanent pacemaker was considered travelled at least 110 miles—to Aberdeen, Edinburgh, or Glasgow.

The first permanent pacemaker was inserted in Inverness in December 1978, and by December 1986, 129 new implants and 22 pulse generator replacements had been performed. Patients live in the Highland Health Board area and the service has extended to encompass patients from the Western Isles Health Board Area (population 31,500). All implantations were performed by one physician (FK).

EQUIPMENT AND PERSONNEL
The service has been confined to insertion of single chamber unipolar VVI pacing systems. Because of the small number of implants all pulse generators were obtained from one manufacturer (Vitatron UK Ltd, Berkshire), except for a replacement for a failing bipolar pulse generator. Non-positive fixation electrodes (KJ Lucas Electric) were used at the outset, but positive fixation tined electrodes are now used exclusively. Implantations are carried out in a surgical theatre equipped for peripheral vascular angiography with Polydiagnost UPI screening equipment (Phillips Medical Systems). Assisting staff comprise one nurse assistant, one operating department assistant, a radiographer, and a physiological measurement technician (cardiology). Related ancillary equipment includes an ambulatory electrocardiographic monitoring system (Oxford Medical Systems, Abingdon) and a telephonic electrocardiographic transmission system (Cardiotrak, Instromedix).
Table 1  Demographic details of the first hundred patients undergoing pacemaker implantation

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>46</td>
<td>54</td>
</tr>
<tr>
<td>Mean (SD) Age (yr)</td>
<td>74 (9-2)</td>
<td>74 (9-6)</td>
</tr>
<tr>
<td>General practitioner referral</td>
<td>20</td>
<td>28</td>
</tr>
<tr>
<td>Consultant referral</td>
<td>26</td>
<td>26</td>
</tr>
</tbody>
</table>

Results

The case notes and pacemaker records of the first 100 new implantations were reviewed. Table 1 shows the age, sex, and referral source and fig 1 shows the numbers of implantations and pulse generator replacements per year. In addition to the implantations noted here, we know of 24 patients from this area in whom implantation was performed in other centres during the review period. Patients were referred to another pacing centre when the implanting physician was on leave or if a more complex pacing system was required.

Table 2 shows the principal symptoms before pacing with national figures2 for comparison. Syncope and dyspnoea were most common. Other symptoms included tiredness, chest pain, and transient ischaemic attacks.

Complications of pacemaker implantation were not common. There were no fatalities associated with the procedure. One patient died eight days after operation of cardiogenic shock after myocardial infarction. Displacement of the electrode occurred in eight cases, all within four days of implantation: in five of these standard (non-positive fixation) electrodes had been used. Percutaneous subclavian vein puncture was associated with a higher frequency of haematoma formation around the pulse generator (7 of 65 cases) compared with the cephalic route (1 of 27 cases) and the external jugular route (0 of 8 cases).

Table 2  The major presenting symptom of patients referred for implants. National figures (British Pacing Group)2 are expressed in percentages

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
<th>National figure (1985)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syncope</td>
<td>17</td>
<td>27</td>
<td>44</td>
<td>43</td>
</tr>
<tr>
<td>Presyncope</td>
<td>9</td>
<td>10</td>
<td>19</td>
<td>26.8</td>
</tr>
<tr>
<td>Dyspnoea</td>
<td>11</td>
<td>9</td>
<td>20</td>
<td>5.7</td>
</tr>
<tr>
<td>Palpitation</td>
<td>4</td>
<td>5</td>
<td>9</td>
<td>NA</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
<td>3</td>
<td>8</td>
<td>12.5</td>
</tr>
<tr>
<td>Unspecified</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>12.0</td>
</tr>
<tr>
<td>Total</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

NA, not available

The cephalic vein is now used routinely. One patient had a transient respiratory arrest after sedation with diazepam (diazemuls in an oil and water emulsion). In another patient who had congestive cardiomyopathy, a dilated right atrium and ventricle, and tricuspid regurgitation a satisfactory threshold potential could not be achieved. This was attributed to ventricular fibrosis. Intermittent failure to pace was subsequently observed. Exit block occurring in one patient two days after insertion resolved after steroid treatment. Mean (SD) duration of hospital stay after pacemaker insertion was 7.2 (5.2) days for men and 9.1 (8.8) days for women.

Late complications were unusual. Three subjects suffered pectoral muscle twitching, and one of these required reimplantation with a Teflon coated pulse generator. In two subjects the electrode had to be replaced after lead fracture. There were two instances of demand mode failure and one early pulse generator failure. We are unaware of any infective or
Discussion

The range of disorders and indications for pacing in our series are comparable to national figures. Syncope and presyncope were the major symptomatic indications for pacing. Breathlessness and tiredness, however, accounted for a considerable proportion of cases. Recent work has demonstrated subjective and objective improvement in exercise tolerance after ventricular pacing, and in future such patients may make up an increased proportion of those undergoing implantation.

Twenty four hour ambulatory electrocardiographic monitoring has been a useful adjunct to the assessment of patients for pacemaker implantation. Of our first hundred cases, 37 had 24 hour electrocardiographic records obtained and the results significantly influenced the decision to pace in 35 of these. Of particular interest were those whose standard electrocardiogram showed atrial fibrillation. Ambulatory monitoring revealed episodes of bradycardia (rate less than 30 beats per minute) which in five subjects alternated with rates in excess of 150 beats per minute. This wide variation has been demonstrated by others and in the presence of associated symptoms constitutes an indication for pacing.

In a survey of potential candidates for pacemaker implantation the frequency of sinoatrial disorder was approximately equal to that of complete heart block. A subsequent study by the same workers, however, demonstrated a relatively benign prognosis in sinoatrial disorder and our policy has been to restrict pacing to those patients with symptoms. Shaw et al described a preponderance of men in this series. This differs from our experience and may be explained by the older age group of our patients. Our data are similar to those of Martin et al who reported findings from a satellite pacemaker clinic established in a department of geriatric medicine.

Our complication rate compares favourably with published work. McNeill and Taylor noted a similar frequency of catheter displacement using the KJ Lucas electrode. Haematoma formation, which has an associated risk of infection, was a problem when the subclavian route was used. Infective and thrombotic episodes are expected complications of pacemaker implantation, but have not to date occurred in our patients.

Review arrangements are dictated by the advanced age of most of our patients, the local geography, and the availability of telephonic links. Follow up by general physician colleagues in Stornoway, Fort William, and Wick has been facilitated by the introduction of a Cardiotrak telephonic transmission system similar to that described by Shaw et al.

As the number of pacemaker implants rises, it will become increasingly difficult for all regional centres to satisfy the demand. The implantation of standard single chamber VVI pacing systems is well within the capability of the average district general hospital with a physician who has a special interest in cardiology. We did not need to use more complex pacing systems in our elderly population. Single chamber VVI pacing probably remains the system of choice for most elderly sedentary patients, and in 1985, this type of unit comprised 86% of pacemakers implanted nationally. It is unlikely that the requirement for dual chamber pacing systems will increase in the foreseeable future to the point at which physicians in small pacing centres could become competent in their implantation and follow up. For this reason such patients should be referred to a specialist cardiac centre. The advent of single chamber, rate-responsive systems may provide an alternative approach for the small pacing centre.

The requirements for establishing a permanent pacemaker service were outlined by Parsonnet et al. We have found that it is possible to provide such a service in a district general hospital without additional personnel and with little additional equipment. Development of a local service in our hospital has increased the number of patients undergoing pacemaker implantation. The overall implantation rate for patients in this area during the period 1979 to 1985 inclusive was equivalent to 81 per million population per year, rising from 62 per million in 1979 to 152 per million in 1985. The national average figure over the same period was 98 per million popu-
lation per year. In the five year period preceding the institution of a local pacing service only 25 pacemakers were inserted (a rate of 22 per million population per year). Establishment of such a service in district general hospitals remote from a specialist cardiac centre certainly seems justified. Wider provision of pacing services such as ours may result in increased use of permanent pacemakers in the management of symptomatic bradycardia.

References

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Br Heart J 1987 58: 495-498
doi: 10.1136/hrt.58.5.495

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