Cardiac Pacing in Hong Kong: Second Report of the Hong Kong Pacing Registry

THE HONG KONG PACING REGISTRY INVESTIGATORS

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THE HONG KONG PACING REGISTRY INVESTIGATORS: ***Cardiac Pacing in Hong Kong: Second Report of the Hong Kong Pacing Registry.*** *The first permanent pacemaker was implanted in Hong Kong in early seventies. Since then, the use of permanent pacing has steadily increased. The manufactures' sales figures were the only source of reference. In 1990, a Hong Kong Pacing Registry was set up, with the aim to establish a reliable source of pacemaker use in Hong Kong. Data were entered into a registry form during every permanent pacemaker implantation. The areas focused were: patient demographics (sex, age, symptomatology, associated medical illnesses and rhythm problems), pacemaker system characteristics (polarity, programmability and pacing mode) and implant procedure (site and route of entry and implant parameters). A total of 7767 forms were returned for years 1991-2002. There was a steady increase in the number of pacemaker implanted, with 77 and 125 per million population received their first implant in the year 1991 and 2002 respectively. Response rates to most individual items of the returned forms were over 90% (range 2.2-100%). The male: female ratio was 1:1.4. Dizziness (36.1%) and syncope (23.8%) were the main symptoms at presentation, and sick sinus syndrome (31.6%) and high grade heart block (37.3%) were the main rhythm indications for pacing. Significant proportion of the patients had associated medical diseases such as hypertension (24.4%) and ischaemic heart disease (13.3%). The relative frequencies of pacing modes used were: DDDR (34.2%), VVI (29.5%), VVIR (20.8%), DDD (10%), VDD(R) (2.5%) and AAIR (0.7%). The percentage of dual chamber pacemakers had increased from 27% in 1991 to 62% in 2002. Most pacemakers were implanted on the left side, with subclavian puncture technique being the usual procedure. In conclusion, these data from the Hong Kong Pacing Registry give a good account of the patient demographics and pacing practice in Hong Kong for years 1991-2002, which would be useful as a future source of reference. The registry has been updated to include data on new indications for pacing and implantable cardioverter defibilators. (J HK Coll Cardiol 2003;11:63-70)*

Pacing Registry, Permanent pacing, Trends

摘要

在七十年代早期香港就安裝了第一個永久性起搏器。在這之後，永久性起搏器的運用在不斷地穩步增加。而製造商的銷售記錄是唯一的資料參考來源。在1990年，香港建立了起搏器註冊登記制度，目的在於在香港地區建立一個起搏器運用的可靠記錄。每一個永久起搏器的植入，其資料均需輸入登記表格。其內容包括有：病人的人口學特徵（性別、年齡、症狀、伴隨的醫學疾病和心律問題），起搏器系統的特徵（極性、程式和起搏模式）和植入方式（部位、放入途徑和植入參數）。從1991年至2002年總共收回7767份表格。起搏器植入的數量在穩步地增加，1991年和2002年第一次起搏器植入在人群的比例分別為每百萬人植入77和125台起搏器。大部份題目的回覆率超過90%（範圍2.2–100%）。男女比例為1:1.4。臨床表現的主要症狀為頭暈（36.1%）和暈厥（23.8%），病態竇房結綜合症

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（31.6%）和高度的心臟傳導阻滯是安裝起搏器為最主要的心律失常病症。病人伴隨的醫學疾病主要有高血壓（24.4%）和缺血性心臟病（13.3%）。起搏模式相關頻率為DDDR(34.2%)，VVI（29.5%），VVIR（20.8%），DDD（10%），VDD(R)（2.5%）和AAIR（0.7%）。安裝兩室起搏器的比例從1991年的27%增加至2002年的62%。絕大多數的起搏器安裝在左側，鎖骨下穿刺技術是最常用的手段。結論，香港起搏器註冊登記來源的資料能夠很好的說明自1991年至2002年香港病人的人口學特徵和和起搏器安裝情況，這為將來的資料參考很有價值。登記制度目前已更新，包括了安裝起搏器和植入式心臟複律除顫器的有關資料。

關鍵詞：起搏器註冊登記　永久性起搏器　趨勢

Introduction

The practice of cardiac pacing differs enormously between countries.[1] The difference is not only reflected in the implant rate (ranging from 158 per million population in Japan to 13 per million population in Malaysia), but also in the pacemaker prescription. Accurate data in some Asian Pacific countries are not readily available, as a country-wide pacing registry is not implemented in most countries in this part of the world. The implant rate in this region can only be indirectly assessed from manufactures' sales records.

Permanent pacing was first used in Hong Kong in the early seventies. The number of units used has increased over the years, reaching a total implant rate of about 91 per million population in 1991 (from manufacturer sales data). There is a need to gather some basic information on the quality and quantity of pacing practice in Hong Kong. This information could be useful for trend analysis, as well as providing a useful reference source for monitoring device safety and for patient tracking. A Hong Kong Pacing Registry was established in 1990 with this background. Data from the Pre-Registry era (1975-1990) was reported in a previous article.[2] This article summarises the information on the practice of cardiac pacing collected from the Registry since its inception to the year 2002.

Methods

Pacing Registry

A registry form was designed by a working group on pacing registry, who are members of the Hong Kong Cardiological Society (now the Hong Kong College of Cardiology). The registry is now under the Working Group of Cardiac Pacing and Arrhythmias of the College. The questionnaire consists of a total of 12 entry items, which can be grouped into 3 basic categories (Table 1). These are: (1) patient demographics, (2) pacemaker system characteristics and, (3) implant procedure.

A registry form was filled in by the pacemaker representative at the time of implant. In the local setting a pacemaker representative is always present at implantation. Clinical data were supplied by the implanting physician/surgeon. Neither the name of the patients and the implanters, nor the institutions where

Table 1. Entry items in the Hong Kong Pacing Registry

Categories	Entries
Patient demographics	Sex, age, symptoms, medical illnesses, rhythm disturbances
Pacemaker system characteristics	New implant or replacement, lead manufacturer, polarity, pacing mode and manufacturer
Pacing procedure	Date of implant, implant parameters and venous access

the implantation was performed, were required. The completion and return of the registry forms were voluntary.

Data from the received registry forms were entered into a data base system. Statistical analysis were made on the forms received from 1991 to 2002.

Results

Registry Data

To assess the completeness of the voluntary report, the total number of pacemakers sold locally from all the pacemaker companies in Hong Kong were obtained. Only figures for years 1991 and for years 2000-2003 were available. The discrepancy between the number of pacemakers sold locally and number of forms returned to the Registry indicates that not all forms are returned (Table 2). The average returned rate for these years were 83.9%.

With a population of 5.5 million in 1991, the implant rate (from the actual number of pacemakers sold) was about 91 per million population, and rising to 149 per million population in 2002 when the population was about 6.8 millions. The total number of forms returned for 1991-2002 was 7767. There was a steady increase from 427 in year 1991 to 872 in year 2002 (Figure 1).

Table 2. No. of forms returned against No. of pacemakers sold

Year	1991	2000	2001	2002
No. of implants (pacemakers sold locally)	530	783	1096	1012
No. of forms returned	427	732	824	872
% of returned	80.6%	93.5%	75.2%	86.2%

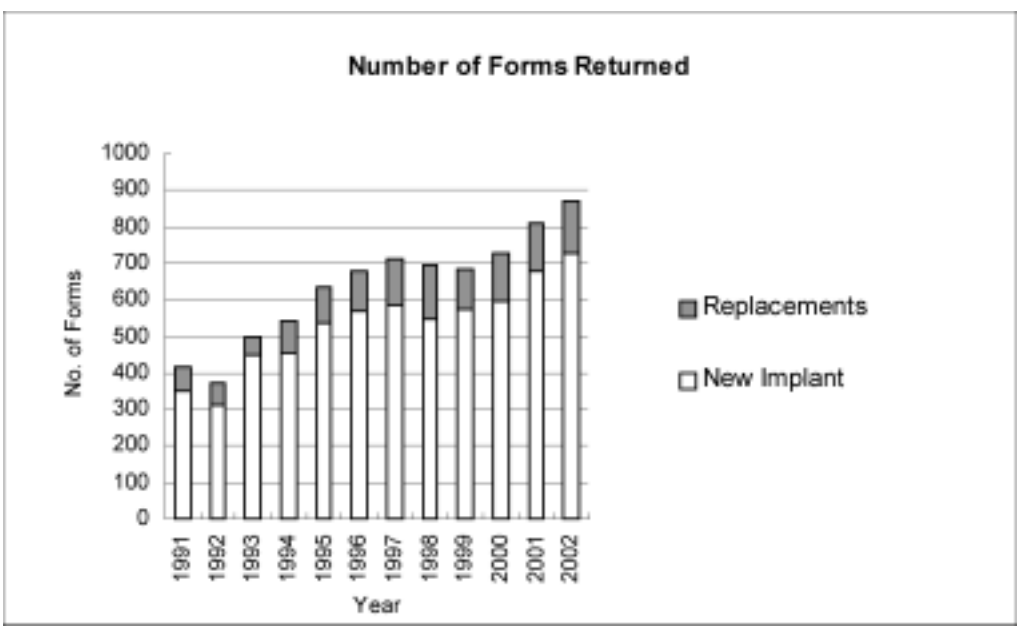

Figure 1. *Number of registry forms returned.*

Patient Demographics

Response rates to individual entries are summarized in Table 3, ranging from 75.2% to 93.5%. The male to female ratio was 1:1.4.

Dizziness (36.1%) and syncope (23.8%) were the main presenting symptoms, and this trend was maintained throughout the study period (Figure 2). The commonest associated medical conditions were hypertension (24.4%) and ischaemic heart disease (13.3%). 19.2% of patients did not have any associated medical illness (Figure 3).

High grade atrioventricular block (37.3%) was

Table 3. Patient demographics

Entries	Number of forms completed	Completion rate
Patient demographics		
Sex	7744	99.8%
Symptoms	7055	90.1%
Medical illness	6111	78.7%
Indication	6008	77.4%
Pacemaker system Characteristics		
All implants	7660	98.6%
Lead manufacturer	7517	96.8%
Pacing mode	7681	98.9%
Pacemaker manufacturer	7055	90.8%
Implant procedure		
Date	7767	100%
Implant parameters	7631	98.2%
Venous access	7418	95.5%

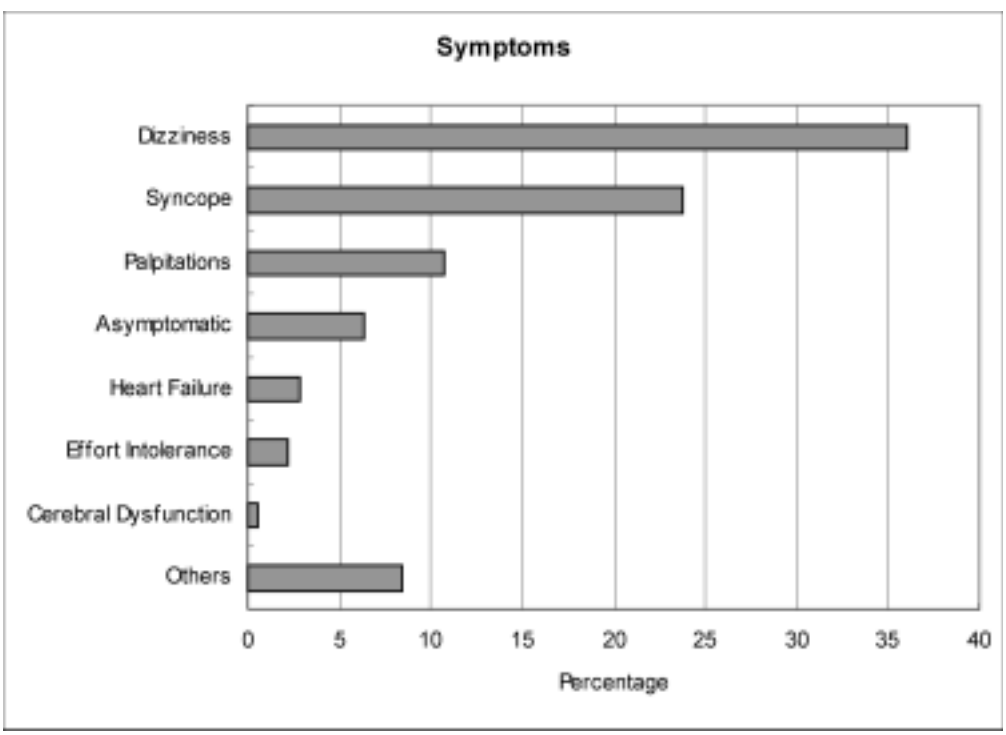

Figure 2. *Symptoms at presentation of patients.*

the commonest indication for permanent pacemaker implantation, followed by sinoatrial disease (31.6%). Similar trend was observed throughout. Amongst patients with sinoatrial disease, sinus bradycardia (10%) and bradycardia-tachycardia syndrome (9.7%) were the main sub-categories. Slow atrial fibrillation/flutter was responsible for 12% of the implants. Intraventricular block was an indication in 1.2% (Figure 4).

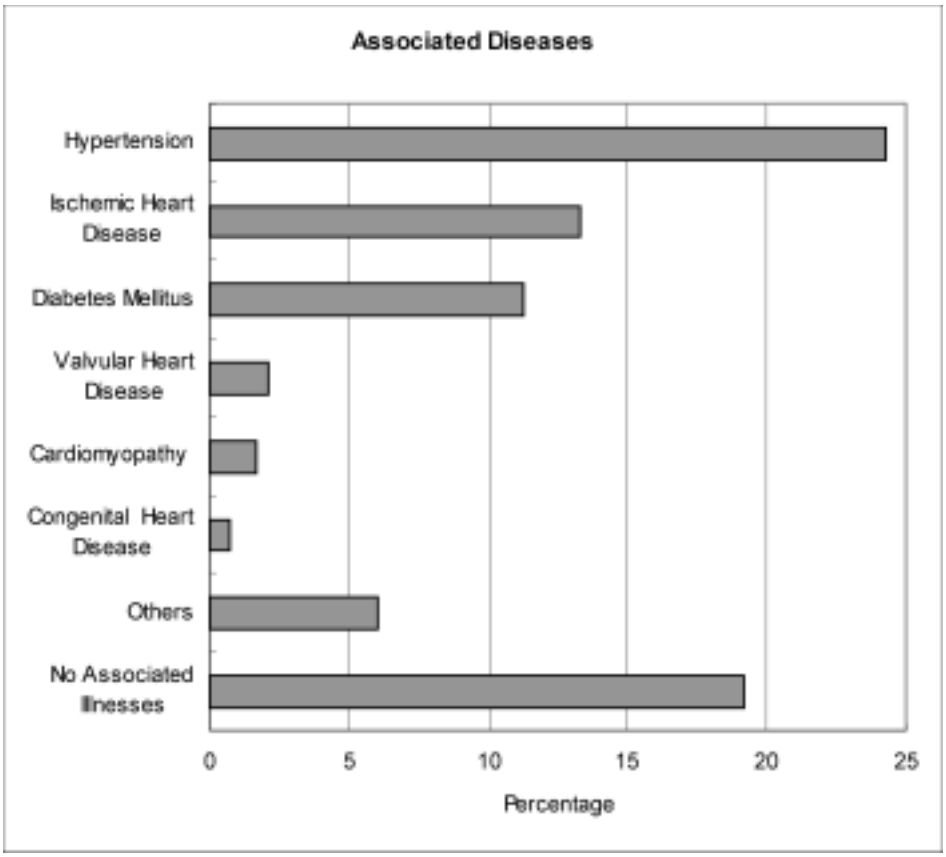

Figure 3. *Incidence of associated illness.*

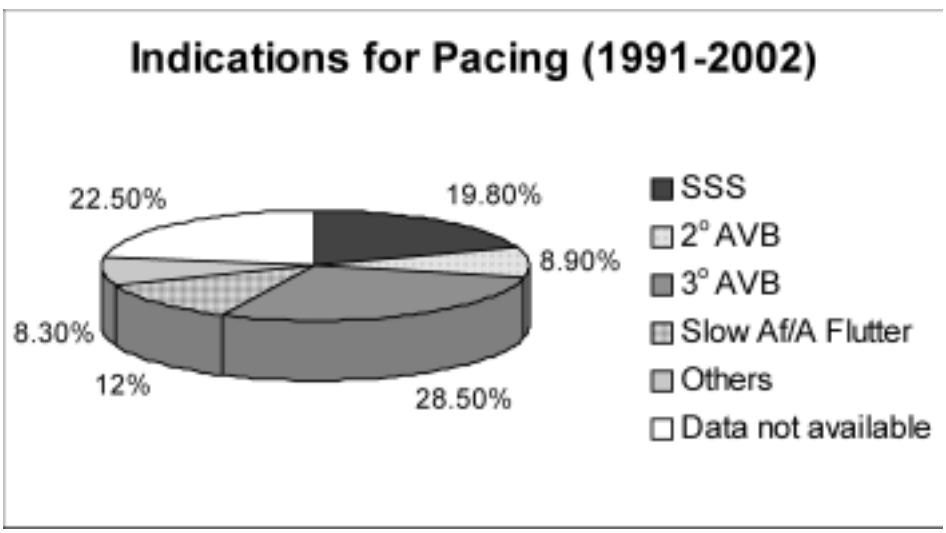

Figure 4. *Indications for permanent pacing.*

Pacemaker System Characteristics

There were 82.5% primary implantations. Between 1991-2002, the main pacing mode used was DDDR (34.2%), followed by VVI pacing (29.5%). Dual chamber modes were used in 44.2%, of which the majority was DDDR pacemakers (Figure 5). A rate adaptive single chamber mode (VVIR, 20.8%; AAIR, 0.7%) was the third commonest pacing mode used. Single lead VDD(R) pacing was first introduced in Hong Kong in 1991,[3] and was utilized in 2.5% cases. There was a steady increase in the use of dual chamber units over the period, compared with 62% dual chamber pacemakers implanted in the year 2002, with only 27% in 1991 (Figure 6).

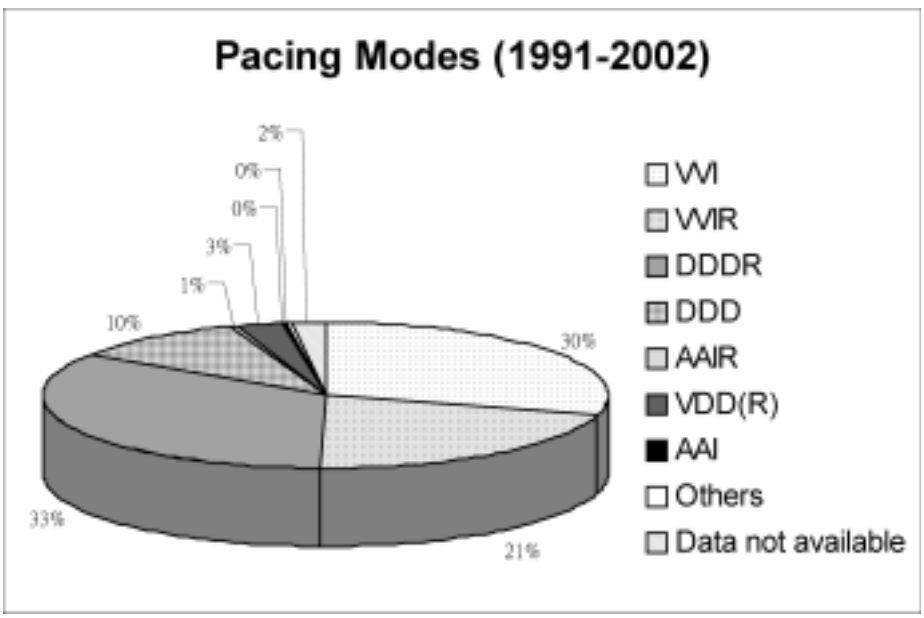

Figure 5. *Pacing modes used.*

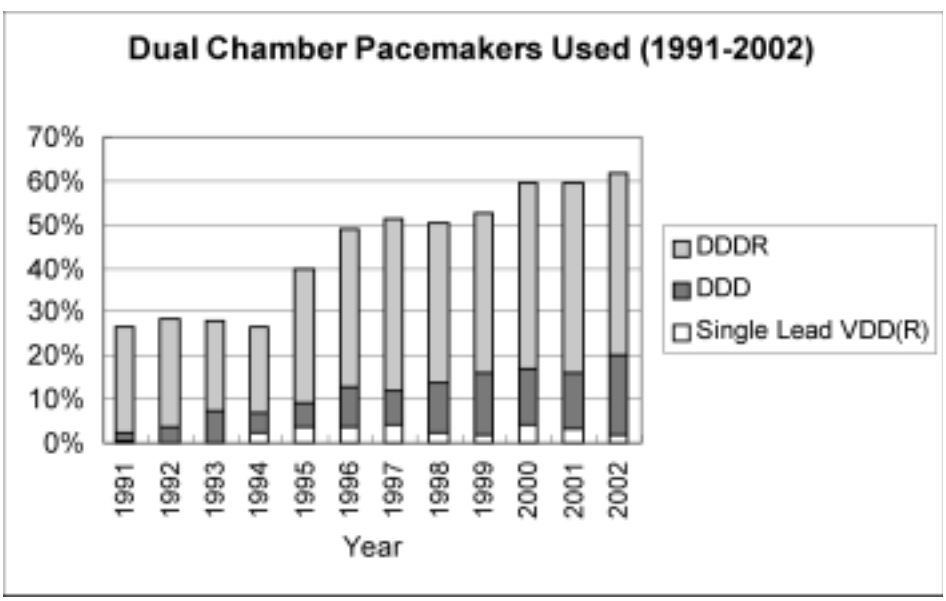

Figure 6. *Use of Dual Chamber Pacemakers in Hong Kong.*

Pacing Procedure

Most pacing systems were implanted on the left side (right : left = 1:4.4). The subclavian route was used in the majority of cases especially for atrial lead placement (ratio of cephalic: subclavian route being 1:3.9 for atrial and 1:2.0 for ventricular leads, respectively). The external jugular cut down route and epicardial placement were used in about 1.35% and 0.8% of cases respectively.

Pacemaker Replacement

There were 1120 first replacement units during these years, and 122 cases of second replacement.

Discussion

The use of permanent pacing on a worldwide basis is significantly affected by the prevalence of symptomatic bradyarrhythmias, socioeconomic state, health care policy and, to a certain extent, physicians' awareness and understanding of permanent pacing.[1,4] As a result, there are significant differences worldwide in the use of permanent pacing, as documented in two surveys in 1986[5] and in 1989[6] respectively.

An implant rate of 149 per million population (or 125 new implants per million) is amongst the highest in Asia; and is comparable to the 158 new implants per million in Japan in 2001. However, this rate is low compared to the developed countries in which data were available, which was 378 and 571 per million in the year 1987-1998 in Europe and the States respectively.[7-8] Perhaps one of the main reasons is that ischaemic heart disease, which is one of the main causes of symptomatic bradyarrhythmias, is high in these countries. Indeed, ischaemic heart disease was an associated condition in about 13.3% of patients with permanent pacemakers in Hong Kong, whereas a figure of 35-78% was quoted in one study from Sweden.[9] On the other hand, hypertension was present in a much more comparable percentage (24.4% in Hong Kong versus 24% in Sweden).

One salient difference between patient demographics in Hong Kong and the Western world is the higher prevalence of female requiring permanent pacing, and the near equal ratio of patients with advanced atrioventricular block and sinoatrial disease as indications for permanent pacing. There was little change in this trend throughout these years.

The utility of dual chamber modes also varied. In the States, 62.4% were dual chamber in 1997.[8] In Europe, it can vary from 17.3% in Croatia to 68.2% in Belgium.[7] In Asia-Pacific region, the dual chamber implant rate in many countries tend to be low. The Hong Kong data on use of dual chamber at 62% puts in amongst that of the developed countries.

Future Role of Pacing Registry

The present registry data, although providing significant information, are limited in several ways. The completion of the Registry form was voluntary, and data collected were somewhat incomplete. Corrections of some minor design defects in the Registry form has been implemented in 2003. Barriers to form completion has been identified and dealt with. The registry has now been updated to include new indication of pacing such as for heart failure, and to include a registry for implantable cardioverter defibrillators.

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Further details of the Hong Kong Pacing Registry are available on request from the Working Group of Cardiac Pacing and Arrhythmias of the Hong Kong College of Cardiology.

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