

Full Length Research Paper

Decade of permanent cardiac pacing in a tertiary care hospital of Northern India

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This study of 10 year review of pacing was undertaken to analyse the continuous rise in the incidence of pacing in this part of country. 532 patients implanted with permanent pacemakers were evaluated during this decade. The age of patients ranged from 6 to 85 years with majority of patients belonging to age group of 55 to 70 years and a male to female ratio of 2:1. The commonest presenting symptom was cardiac syncope seen in 76.50% followed by pre-syncope 31.50%. The indications for pacemaker implantation were complete heart block 48.12%, sick sinus syndrome 19.17%, symptomatic bifascicular block 12.96%, Mobitz type II 2nd degree heart block 7.14%, permanent pacemaker dysfunction 5.85%, trifascicular block 5.63% and high degree AV block 1.13%. The commonest risk factors encountered in these patients were smoking 59.21%, followed by hypertension 26.32%, only 0.56% had no evidence of risk factor. The complications following pacemaker implantation were seen in 8.27%, 2.26% got lead displacement, 1.69% got wound infection, 1.69% got extrusion of generator. Other complications include lead fracture in 0.9%, premature battery failure 0.37% patients, high threshold in 0.19%, Pneumothorax in 0.19% and 0.5% got reimplantation because of generator expiry. Out of 532 patients paced permanently in the past decade, 458 patients followed regularly which revealed that majority of them were totally dependent upon the permanent pacemaker and had improved quality of Life.

Key words: Invasive electrocardiography study, Complete heart block

INTRODUCTION

Pacemaker is an implantable electronic device which takes over the command of cardiac rhythm in failure of the natural mechanism. The therapeutic results achieved by these devices are among the most spectacular of the modern medicine. This is attributed to the continuous research and curiosity of medicine professional to treat the every aspect and complication of disease and not to watch as helpless observers. Ever since pacemakers

were introduced in the 1950s, the pacing technology has witnessed remarkable innovation (Jayapandian et al., 2013). The major indication for cardiac pacing continues to be the failure of impulse formation or failure of conduction. This results from degeneration, fibrotic, atherosclerotic process leading to damage of pacemaker cells and conduction fibres. The infective rheumatic, vascular, infiltrative and neoplastic disease process too

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Table 1. Age wise distribution of patients.

Age group (Years)	No. of cases (%)
< 25	08 (1.50)
25-40	69 (12.97)
40-55	182 (34.21)
55-70	237 (44.55)
>70	36 (6.77)
Total	532 (100)

Table 2. Sex distribution of patients.

Sex	No. of cases (%)
Males	364 (68.40)
Females	168 (31.60)
Total	532 (100)

contribute. This has led to the steady rise in the number of pacing per million populations in every country almost all over the globe (Charles et al., 2015). The elderly patients aged 60 years and above with syncopal attacks due to varying arrhythmias, have high mortality, high risk of sudden death and so need cardiac pacing (Mond and Proclemer, 2011). The rate of cardiac pacing in various arrhythmias remains unchallenged. There has been alarming intermittent increase in pacing probably attributed to the rise in the incidence of coronary artery disease and the subsequent development of varying Bundle Branch Blocks, Sinus Node dysfunction (Epstein et al., 2008). There has been a progressive rise in the percentage of patients with pacemaker implanted in the past decade at our centre also. The retrospective and prospective study of this decade will be a useful scientific data to frame the guidelines for the future and to formulate / tabulate the indications for cardiac pacing in our day to day patient care. This will also help to lay down the indications and situations where the pacing is needed because of intermittent symptomatic arrhythmias. It will give us the opportunity to review the unexplored follow up of these patients in the form of life style, cardiac status, morbidity and mortality due to cardiovascular and other systemic related causes. This data will give us the enormous material about the complications of pacing in our patients and enlightenment to prevent these in future.

MATERIALS AND METHODS

The study comprised of retrospective and prospective review of patients with permanent pacemakers implanted in a tertiary care hospital between 2004 and 2014. The study was started in 2009 and comprises of initial five years of screened hospital records of paced patients and enrolment of all permanently paced patients in the

next five years. The case records of all patients permanently paced in our hospital were screened thoroughly for subjective and objective indication for pacing, any associated disease, acute or chronic nature of the basic disease, and its progress was reviewed. Immediate and late complications, follow up of these patients in pacemaker clinics, their life span, quality of life, overall mortality was studied.

RESULTS

The clinical spectrum of 532 patients implanted with permanent pacemakers is presented, with the analysis of various parameters given in the various tables. The age of patients ranged from 6 to 85 years with a mean age of 52.82 ± 16.85 years. Majority of patients implanted with pacemakers were in 55 to 70 years age group (44.55%) followed by 182(34.25%) in 40 to 55 years (Table 1). Males outnumbered females by a ratio of 2:1. There were 364(68.40%) males and 168(31.60%) females (Table 2). The commonest presenting symptom was cardiac syncope seen in 407 patients (76.50%) followed by presyncope present in 168 (31.50%) patients. Other presenting symptoms in order of frequency included palpitations in 144 (27.06%), chest pain (angina) in 54(10.1%) patients, convulsions in 50 patients (9.3%) patients and Congestive Heart Failure in 10 patients (1.8%) patients (Table 3). More than one symptom was present in a case. Complete heart block formed the largest group of patients in this study of permanent pacemaker implantation as seen in 256 patients (48.12%) including 2 patients of congenital complete heart block and 34 patients (6.35%) progressing to complete heart block from previous Bundle Branch Block. The second commonest indication for permanent pacemaker implantation was Sick Sinus Syndrome in 102

Table 3. Symptom distribution / presentation.

Presenting symptoms	No. of cases (%)
Cardiac syncope	407 (76.50)
Presyncope	168 (31.58)
Palpitations	144 (27.07)
Angina	54 (10.15)
Convulsions	50 (9.0)
Congestive heart failure	10(1.88)

Table 4. Analyses of indications of permanent pacemaker implantation.

Indication	No. of cases (%)
Complete heart block	256 (48.12)
Sick sinus syndrome	102 (19.17)
Bifascicular block	69 (12.96)
Mobitz type-II, 2 nd degree heart block	38 (7.14)
Permanent pacemaker dysfunction	31 (5.85)
Trifascicular block	30 (5.63)
High degree Av block	06 (1.13)
Total	532 (100)

Table 5. Percentage of patients with underlying bundle branch blocks progressing to complete heart block.

Type of bundle branch block	No. of cases (%)
Left bundle branch block	15 (2.8)
Rt. bundle branch block + left anterior hemiblock	9 (1.69)
Rt. bundle branch block	8 (1.5)
Left anterior hemiblock	1 (0.18)
Left posterior hemiblock	1 (0.18)
Total	34 (6.3)

patients (19.17%). Among fascicular blocks, 30 patients of Trifascicular block (5.63%), were paced and 69 patients (12.96%) of bifascicular block, 38(7.14%) patients of mobile type-II, 2nd degree heart block were also paced followed by 31 patients (5.85%) of permanent pacemaker dysfunction. The least number of patients 06(1.13%) of high degree AV block were also paced (Tables 4 and 5). While determining the association of risk factors it is found that the influence of risk factors was highly significant ($P<.0001$) with the commonest risk factors being smoking among 315(59.21%) patients followed by hypertension 140(26.32%) patients. Only 03(0.56%) cases had no evidence of risk factor. However the risk factors with the least magnitude were identified in the form of obesity in 35 patients (6.58%), diabetes mellitus-28(5.26%) cases, hypercholesterolemia in 06(1.13%) patients and sedentary habitus among 05(0.94%) patients (Table 6). The overall complication

rate was significantly ($p<0.0001$) found of lower magnitude 44(8.27%). The complications following pacemaker implantation were seen in 44(8.27%) patients. 12(2.26%) patients got lead displacement, 09(1.69%) patients got wound infection, 09 (1.69%) extrusion of generator. Other complications included lead fracture in 05 patients (0.9%), premature battery (generator) failure in 02(0.37%) patients, and high threshold in 01(0.19%) patients and Pneumothorax in 01(0.19%) patients. 05(0.94%) patients got reimplantation because of generator expiry (Table 7).

DISCUSSION

Bradyarrhythmias are a cause of sudden death everywhere in the world, although the precise incidence is unknown. Pacemaker implantation is an accepted intervention

Table 6. Risk factor analyses.

Factors	No. of cases (%)
Smoking	315 (59.21)
Hypertension	140 (26.32)
Obesity	35 (6.58)
Diabetes mellitus	28 (5.26)
Hypercholesterolemia	6 (1.13)
Sedentary habitus	5 (0.94)
None	3 (0.56)
Total	532 (100)

Table 7. Complications of permanent pacemaker implantation encountered in 532 patients.

Complication	No. of cases (%)
Wound infection	09 (1.69)
Extrusion of pacemaker generator	09 (1.69)
Lead displacement	12 (2.26)
Lead fracture	05 (0.94)
Generator expiry	05 (0.94)
Generator failure	02 (0.37)
High threshold	01 (0.19)
Pneumothorax	01 (0.19)
Total	44 (8.27)

which has been shown to improve the quality of life and reduce mortality in patients with bradyarrhythmias (Falase et al., 2013). Kashmir valley is inhabited by a relatively homogenous inbreeding population with dietary practices and living conditions that do not differ significantly across the valley. A pacemaker implantation and follow up service has been established in our institution and robust database has been developed and maintained. In the experience of Thomas et al from Lagos, 100 patients were implanted between 1999 and 2004. Average age was 62 years, 93% of patients were female, 86 % patients were diagnosed with complete heart block and overall 89% received single chamber ventricular pacing and 11% received dual chamber pacing, No complications were recorded. The Enugu experience is a smaller series of 23 implants done between 2001 and 2006 in which the mean age was 70 years, 65% of patients were in complete heart block, endocardial leads were used in 65% of cases, and epicardial leads in 35% of cases (Ekpe, et al., 2008). There is also published experience in 2003 from Dakar Senegal of 92 implants over a 3 year period. There was an equal male to female ratio and 87% of implants were single chamber ventricular pacing. Complications seen in the series were pacemaker infections in 5 patients, 3 lead displacements, 1 pacemaker syndrome and 8 patients that died during

follow up of non-pacemaker related causes (Thiam et al., 2003). The present study reveals the age of patients ranged from 6 to 85 years, majority belonging to age group of 55 to 70 years and males outnumbering females with ratio of 2:1. These findings are consistent with the 11th world survey of cardiac pacing and implantable cardioverter-defibrillators where age of patients ranged from 60 to 75 years and males outnumbered females (Mond and Proclemer, 2011). Similar to the findings of West African series' most of our patients implanted with pacemakers were having completed heart block. This is unlike the pattern in the western world where 30% or less of patients present with complete heart block and sinus node dysfunction is the predominant indication of cardiac pacing (Mond and Proclemer, 2011). 70% of our patients have been implanted dual chamber pacemakers and this trend has increased particularly during the last five years of study period. This is consistent with the current trend all over the globe as dual chamber pacing is more physiological in view of hemodynamic benefits of atrioventricular synchrony that in turn translates into improved longevity and improved quality of life (Clarke et al., 1991). The complete heart block as shown in our study is idiopathic in majority and is the major conduction defect. The magnitude of patients taken for permanent pacemaker implantation also remarkably increased in the

last five years of the decade. The appreciable increase in permanent pacemaker implantation is attributable to early referral services and appropriate investigative facilities, improved peripheral healthcare services, awareness about the cardiac problems among the common people. The overall complication rate in our implantations was low and most of the complications like lead displacement, wound infection, lead fracture have occurred in the initial years of decade and may be attributed to the initial learning curve. Ever since pacemakers were introduced in the 1950s, the pacing technology has witnessed remarkable innovation. Much of the pacemaker related complications may be prevented by leadless pacemakers which have the ability to pace chronically and reliably when lodged endocardially (Jayapandian et al., 2013).

Out of 532 patients paced in the last decade, 458 patients followed regularly who revealed that majority of them were totally dependent upon the permanent pacemaker. This good number of patients attending pacemaker follow-up clinic was again attributable to awareness about the cardiac problems among the common people. The dropouts in our pacemaker follow-up clinic numbered 52. 22 patients paced permanently died because of cardiac (viz; Acute Coronary Event) / Non cardiac diseases. Out of 22 patients 09 died of Acute Coronary Events, 07 died of Cerebrovascular Accidents (4 subarachnoid Haemorrhage, 03 Intracerebral Bleed) and 6 patients died of bronchogenic carcinoma. In spite of these complications it was seen that overall quality of life improved considerably in these paced patients and were free of life-threatening syncopal attacks.

Conclusion

A pacemaker implantation and follow up service has been established in our institution and a robust database has been developed and maintained. Main indications for implantations are complete heart block, sick sinus syndrome and symptomatic bifascicular blocks. The number of implants and dual chamber pacing has particularly increased during the last five years of study period indicating awareness of cardiac problems among the common people and possibly improved referral services. Complications rates are decreasing due to gained expertise. Regular follow-up in pacemaker clinic indicates public awareness.

Conflicts of Interests

The authors have not declared any conflict of interests.

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