CARDIAC PACEMAKER IMPLANTATION AT RV APEX AND SEPTUM AND QRS WIDTH

Zahid Jamal Zia Yaqub Shabahat Ali Muhammad Ashraf Tahir Saghir Madiha Jahan Fouzia Alam

ABSTRACT

OBJECT: To determine the intraoperative difference in QRS width at RV apex and Septum in PATIENTS OPERATED FOR IMPLANTATION OF PACEMAKERS.

METHODS: A descriptive cross sectional study was conducted in 18 subjects who need pacemaker implantation were operated in NICVD (National institute of cardiovascular diseases) Pacemaker lab. The primary end point was to determine the difference in QRS width when pacemaker screw lead was placed at RV apex and at septum.

RESULTS: The mean RV apex QRS width was 169.41ms whereas mean septum QRS width was 125.29 ms that is the difference of 44.12ms between the two with p< 0.001.

CONCLUSION: The results showed that QRS width at RV septum is narrow as compared to RV apex and thus formulates a hypothesis for conducting a cohort study in future.

INTRODUCTION

There are about 3 million people worldwide with pacemakers, they not only include those with aged 60 or older but are of all ages, and even children's may need pacemakers; each year 600 000 pacemakers are implanted worldwide.[1] Although almost all pacemakers are implanted for bradycardia but there are other symptoms as well which need pacemaker implantation like fainting , dizziness, lack of energy, fatigue, shortness of breath.[1]

There are many studies which have shown ECG changes on pacemaker implantation.[2,8] Few of these studies have also shown focused on changes in QRS complexes during pacemaker implantation.[3,8] These studies although have their primary objective not on QRS but have shown changes in them. While in few of the studies where DDD was paced at ventricular apex, RVOT and proximal septum in patients with normal left ventricular function there was no significant difference in QRS duration.[2] But a rigorous, systematic and in depth review of the literature have shown no such studies been conducted in our community and especially relating to effect of pacemaker implantation on QRS width.

As wide QRS complex may carry higher risk of developing heart failure with right ventricular pacing.[8] This provides a very strong rationale for us to conduct a cross sectional study in first instance so as to determine any association (not cause-effect) between pacemaker implantation at two different sites (RV apex and septum) and QRS width. The association if found will then formulate our hypothesis to perform a cohort study (on patients with RV apex and septum implantation and development of heart failure in them) in the near future.

** Address for correspondence;*
Department of Cardiology
National Institute of Cardiovascular Diseases
Karachi

METHODOLOGY

A cross sectional study was done in NICVD (National institute of cardiovascular diseases) Pacemaker lab from 14th June 2007 to 30th April 2008 enrolling 18 patients through non probability purposive sampling with inclusion criteria of all those patients who need pacemaker implantation. There were no exclusion criteria. All the patients fulfilling inclusion criteria and need implantation of single/dual pace makers were recruited after taking informed consent. The ethical approval was also obtained from the ethical committee of the institution before starting the study. They were explained the procedure, importance and scope of the study. The selected patients were then taken to pacemaker lab where the pacemaker was typically inserted into the patient through simple surgery using a same local anesthetic to every patient. An incision is made in the left shoulder area below the collar bone where the pacemaker was implanted. For this study pacemaker lead used was screw one. As we want to place the electrode not only in apex but also in septum. The

screw lead was introduced into the heart through a subclavian/brachiocephalic vein using fluoroscope as a guidance tool to monitor the progress of insertion. The procedure was performed by the principal investigator himself. The screw lead was first placed into the Right ventricle apex and then into the septum. On both occasions the QRS width, was noted by the experienced and trained technician to eliminate the researcher bias.

The lead was then finally fixed to the place where the researcher found it more beneficial and appropriate. It did not affect our study as the final placement and insertion of the pacemaker was not in our objective. The data was collected and entered in SPSS software version 13, for analysis. In statistical analysis descriptive statistics was used for quantitative variables reported as means ± S.D. The independent "t" test was applied to know the mean difference between QRS width of RV apex and septum, $p<0.05$ was considered significant.

RESULTS

There were 18 subjects out of which 8 (44%) were males and 10 (55.5 %) were females. The overall mean age of the patients was 56.94 ±16.81 years with age range between 16-85. The mean QRS width at RV apex was 169.41ms ±4.41ms and mean septum QRS width was 125.29ms ± 4.46ms. The mean difference in QRS width was found as 44.12 ms ($p<0.001$)

DISCUSSION

The results showed that cardiac pacemaker implantation at RV septum was associated with narrow QRS complexes with mean duration 125.29ms at $p<0.001$ as compared to implantation at RV apex. These results were very similar to previous studies done on RV septal pacing showed the advantages of shorter depolarization time, less ventricular contractile asynchrony, better mechanical performance and preserved chronotropic response on myocardial contractility in comparison with apical pacing.[7] But in contrast to results showed by other studies that showed that QRS duration did not show significant differences during DDD pacing from ventricular apex, RVOT and proximal septum.[2]

CONCLUSION

The above results concluded that pacemaker implantation at RV apex is associated with wide QRS width than implantation at RV septum. Thus generating a new hypothesis of whether pacemaker implantation at RV apex is associated with heart failure to be tested in near future.

REFERENCES

1. Wood MA, Ellenbogen KA. Cardiac pacemakers from the patient's perspective Circulation. 2002;105:2136-8.
2. Alboni P, Scarfò S, Fucà G, Mele D, Dinelli M, Paparella N. Short-term hemodynamic effects of DDD pacing from ventricular apex, right ventricular outflow tract and proximal septum. G Ital Cardio. 1998 Mar;28(3):237-41.
3. van Gelder LM, el Gamal MI, Tielen CH. Changes in morphology of the paced QRS complex related to pacemaker output. Pacing Clin Electrophysiol 1989 Oct;12(10):1640-9.
4. anagisawa A. Clinical significance of QRS complex during ventricular pacing: a non-invasive study. Jpn Circ J. 1981 Feb;45(2):181-94.
5. Friedberg HD. Evaluation of unusual QRS complexes produced by pacemaker stimuli—with special reference to the vectorcardiographic and echocardiographic findings. J Electrocardiol. 1980 Oct;13(4):409-15.
6. Furman S, Hurzeler P, DeCaprio V. The ventricular endocardial electrogram and pacemaker sensing. J Thorac Cardiovasc Surg. 1977 Feb;73(2):258-66.
7. Yu CC, Liu YB, Lin MS, Wang YJ, Lin LC. Sepal pacing preserving better left ventricular mechanical performance and contractile synchronism than apical pacing in patients implanted with an atrioventricular sequential dual chamber pacemaker. Int J Cardiol. 2007;118(1):97-106.
8. Pap P, Fürge G, Bencsik A, Makai L, Sághy T. Native QRS complex duration predicts paced QRS width in patients with normal left ventricular function and right ventricular pacing for atrioventricular block. J Electrocardiol. 2007;40(4):360-4.