นิพนธ์ต้นฉบับ

Selection of permanent pacemaker in severe cardioinhibitory vasovagal syncope.

Surapun Sitthisook *

Sitthisook S. Selection of permanent pacemaker in severe cardioinhibitory vasovagal syncope. Chula Med J 1994 May;38(5): 255-262

Tilt table test was done in 38 patients with syncope of unknown origin or presumptive diagnosis of vasovagal attack. There were 11 males and 27 females with average age of 36.9 years. 19/38 patients (50%) had a positive tilt table test. The permanent pacemakers (1 AAI, 2VVI) were implanted in 3 patients of malignant vasovagal syncope in whom the preimplantation test showed that pacemaker could abort the syncopal attack. The type of single chamber pacemaker could be determined by the evidence of AV block during syncope, limited electrophysiologic study with tilt test or tilt test with standby temporary programmable dual - chamber pacemaker. The patients had no syncopal attack post permanent pacemaker implantation for the follow - up period of 3 - 14 months.

Key words : *Permanent pacemaker, Vasovagal syncope.*

Reprint request : Sitthisook S, Department of Medicine, Faculty of Medicine, Chulalongkorn University, Bangkok 10330, Thailand.

Received for publication. May 4, 1994.

*Department of Medicine, Faculty of Medicine, Chulalongkorn University.

สุรพันธ์ สิทธิสุข. การเลือกใช้เครื่องกระตุ้นหัวใจถาวรในผู้ป่วย วาโซเวกัล ซินโคป. จุฬาลงกรณ์เวชสาร 2537 พฤษภาคม ;38(5): 255-262

ในปี 1992 - 1993 ได้ทำการตรวจ tilt table test ในผู้ป่วย syncope of unknown origin และผู้ป่วย vasovagal attack จำนวน 38 ราย เป็นชาย 11 ราย หญิง 27 ราย อายุเฉลี่ย 36.9 ปี ผล positive tilt test จำนวน 19 ราย (50 %) ผู้ป่วย 3 รายที่ให้ผล positive มี syncope ร่วมกับ long sinus arrest ผู้ป่วย 1 ราย ได้รับการใส่ atrial PPM (AAI) และผู้ป่วยอีก 2 ราย ได้รับการใส่ ventricular PPM (VVI) การเลือกชนิดของเครื่องกระตุ้นหัวใจถาวร (PPM) อาจทำได้โดย

1. *ECG ขณะเกิด vasovagal syncope ดูว่ามี AV block หรือไม่*
2. *limited EPS ขณะเกิด vasovagal reaction โดยมี standby pacer*
3. *ทำ tilt test ในขณะที่ผู้ป่วยมี standby DDD temporary pacer*

ผู้ป่วยทั้ง 3 ราย ได้รับการตรวจก่อนใส่ PPM ว่า pacemaker สามารถป้องกันการเกิด syncope ได้ และได้รับการตรวจติดตามผลเป็นเวลา 3-14 เดือนโดยไม่พบอาการ Syncope อีก

Vasovagal syncope is a common problem in recurrent idiopathic syncope.[1] Its mechanism is not completely understood. The afferent reflex arc was triggered by venous pooling or upright posture.[2] A decrease in ventricular preload causes an increase in sympathetic activity due to the diminished baroreceptor reflex. The mechanoreceptor, a nonmyelinated C-fiber in the inferoposterior wall of the left ventricle is then stimulated because of the increased left ventricular contraction. The central nervous system responses in the way that an increase in parasympathetic activity and sympathetic withdrawal occurs. The patients develop hypotension and syncope as a result of bradycardia (cardioinhibition) and vasodilatation (vasodepression).

The head - upright tilt table test, a provovative test for vasovagal syncope is commonly used as a diagnostic evaluation of unexplained syncope.[3-5] the reported sensitivity is 20 - 75 %[3,4,6,7] according to the degree and duration of tilt or whether or not isoproterenol infusion is used.[8,9] Malignant vasovagal syncope is defined as tilt - induced asystole , a severe form of cardioinhibitory vasovagal reaction.

The treatment of vasovagal syncope with permanent pacemaker is still controversial. Fitzpatrick A. et al.[10] reported that dual chamber pacing might abort syncope in 85 % of patients with cardioinhibitory vasovagal attack. Samoil D. et al.[11] have shown that when cardiac pacing is required, atrioventricular sequential pacing is superior to single chamber ventricular pacing. However, there has not been any report describing how to select a single chamber pacemaker in order to keep atrioventricular synchronization in vasovagal syncope.

Tilt table test protocol

Head-up tilt test was done in 38 patients (11 males,27 females) of unexplained syncope who were examined by cardiologists and neurologists. Physical examination and noninvasive tests such as electrocardiogram, Holter monitoring, chest X-ray, echocardiogram, electroencephalogram were normal in all patients. Having 6-hour fasting period, the patients had 5% dextrose water to keep vein open. The table was tilted at 15° for 2 mins , 30° for another 2 mins then 60° for 30 mins. Electrocardiographic, heart rate and noninvasive blood pressure monitoring was done every minute during tilt including 5 minutes before and after tilt in supine position. The tilt test is defined a positive when the patient develops syncope and hypotension with or without bradycardia/asystole. If the test is negative, intravenous isoproterenol was administered at the dosage of 1-5 ug/min, gradually titrated until 25 % increase in baseline heart rate was achieved. Then repeated tilt at 60° for 10 minutes was performed.

Results (table 1)

8 patients had a positive test without isoproterenol and 11 patients had a positive test with isoproterenol infusion. Total numer of positive test was 19/38 (50 %). There were 3 patients who had malignant vasovagal syncope. Table 2 showed the details of the three patients.

Table 1. The results of Tilt test in unexplained syncope.

Total No. of the patients	38
male	11
female	27
average age	36.9
Positive tilt test	19
without isuprel	8
with isuprel	11
Negative tilt test	19

Table 2. The permanent pacemaker implantation in malignant vasovagal syncope.

No.	Sex	Age	HUT	EPS	PPM	FU(m.)
1	77	M	high degree AV block	Yes	VVI	14
2	24	F	9.6 secs asystole.	limited EPS with tilt	AAI	9
3	28	M	20 secs asystole	temporary AAI->VVI	VVI	3

HUT = Head-up tilt , PPM = permanent pacemakers

EPS = Electrophysiologic study , FU = follow - up period

Patient # 1 is a 77 year old monk with a history of recurrent syncope for 6 months. Tilt test revealed positive result with high degree AV block which disappeared at supine position as shown in (Fig 1 A). The patient underwent electrophysiologic study which revealed latent AV nodal disease (Wenckebach block at 480 ms cycle length of incremental atrial pacing). He was implanted a ventricular permanent pacemaker (VVI) and has been followed up for 14 months without recurrence.

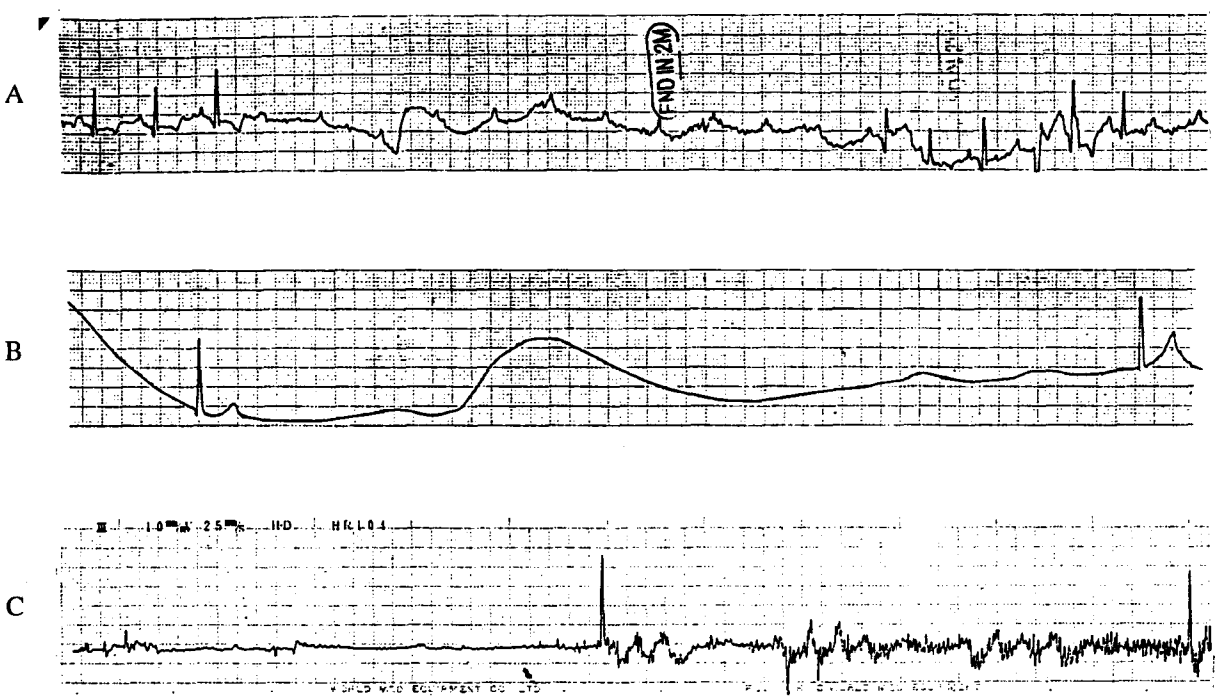

Figure 1. Electrocardiogram during syncope at the initial tilt table test in the patient # 1 (A), # 2 (B) and # 3 (C).

Patient # 2 is a 24 year female patient with a history of recurrent syncope for 3 months. She had 9.6 second asystole with syncope and tonic convulsion at the time the tilt test was positive (Fig 1 B). The tilt test was repeated with standby tempory pacemaker and quadpolar electrode catheters were put in to record right atrial and his bundle electrogram. The limited electrophysiologic study was done at baseline, 60° tilt and when the patient had syncope to determine sinus node recovery time and atrioventricular conduction delay (Fig.2 A). An atrial permanent pacemaker was implanted after the preimplantation test demonstrated that pacing could abort syncope. She has been followed for 9 month without recurrence

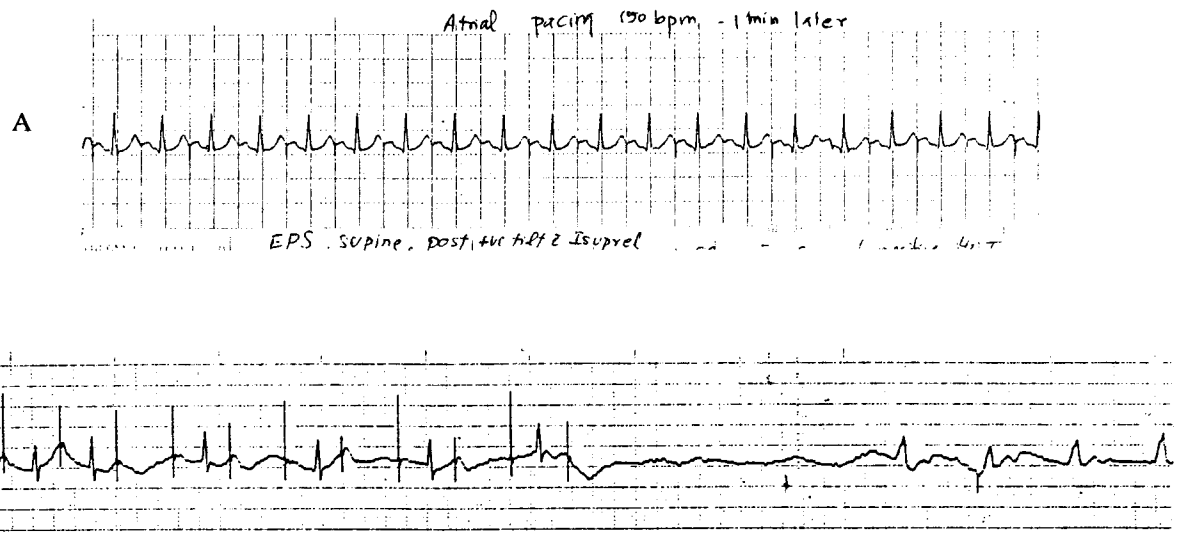

Figure 2. Electrocardiogram during positive test of the preimplantation tilt evaluation showing atrial pacing without atrioventricular block in patient # 2 (A) and atrial pacing with 2 : 1 atrioventricular block in patient # 3 (B). The artificial pacing was quickly programmed to VVI in the patient # 3 (B).

Patient # 3 is a 28 year male patient with a history of syncope x 2 in the past two years. He had tilt - induced 20 second aystole mimicking cardiac arrest (Fig. 1 C) . External cardiac massage was initiated and 1.2 mg intravenous atropine was administered. Tilt test with standby programmable dual chamber pacemaker revealed 2:1 atrioventricular conduction at atrial pacing rate of 100 bpm (Fig. 2 B). The preimplantation test showed that pacing could abort syncope. A single chamber ventricular permanent pacemaker (VVI) was implanted without recurrent syncope for three month follow - up.

The preimplantation tilt test with standby temporary pacer demonstrated in all three patients that pacing could abort syncope although the patients still had significant hypotension and one patient (#2) had near syncope. The postimplantation tilt test done within 1 - 3 months revealed properly functioning pacemaker at the time of positive tilt test (Fig.3). The rate hysteresis was set (50/80) in the patients who had ventricular pacemakers.

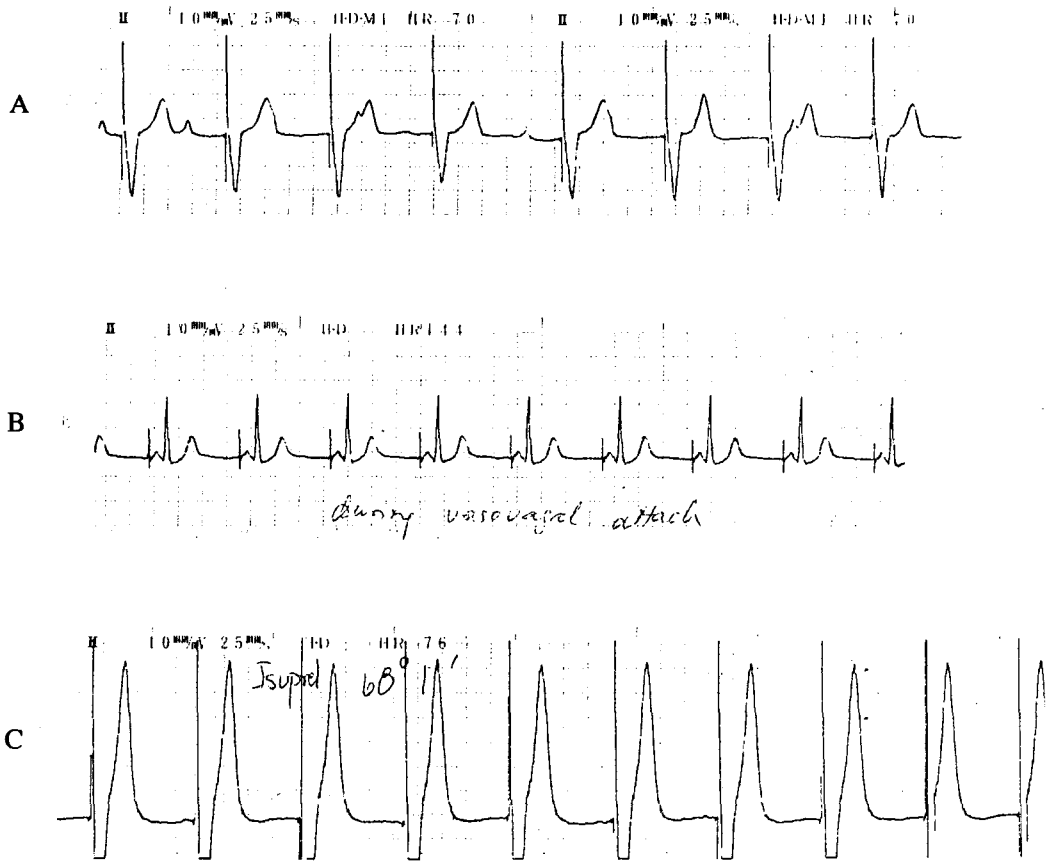

Figure 3. Electrocardiogram of the post permanent pacemaker implantation in the patient # 1 (A), # 2 (B) and # 3 (C) showing properly functioning artificial pacemaker during cardioinhibory vasovagal reaction.

Discussion

Although the dual chamber pacemaker with rate hysteresis is more effective in the treatment of vasovagal syncope than single chamber pacemaker, single chamber atrial pacemaker can keep physiologic atrioventricular synchronization in the patients who have no significant atrioventricular conduction defect during syncope. The ways we can determine atrioventricular conduction during vasovagal attack are the observation for the evidence of atrioventricular block when the patients has syncope or performing limited electrophysiologic study with tilt or tilt with standby temporary dual chamber pacer that can be programmed quickly from AAI to VVI in case that high degree AV block develops. If there is no significant AV conduction defect at atrial pacing rate less than 100 bpm, atrial pacer can be as effective as dual chamber pacer to keep physiologic atrioventricular synchronization.

The preimplantation tilt test with standby temporary pacemaker should be performed in all patients in whom we plan for pacemaker implantation to evaluate the benefit of pacemaker. The test in our three patients demonstrated that pacing could abort syncope or lessen the alteration in consciousness during the attack. Consequently, the patients should have a chance to avoid body injury or call for help.

Recently, Sra J, et al.[12] reported that in patients with neurocardiogenic syncope associated with bradycardia or asystole, drug therapy is often effective in preventing syncope, whereas artificial pacing is not. This study was done in 6 patients who had asystole and 16 patients who had bradycardia along with hypotension in response to tilt test. Although artificial pacing had a little effect on hypotension, the number of tilt-induced syncope was decreased from 18/21 to 5/21. The argument to the auther's comments was also discussed by Glikson, M. and Hayes, D.[13] In addition, the conclusion that pacer is not effective in preventing recurrent syncope was drawn from only one patient. The comparative study with more number of patients is required.

Implantation of permanent pacemaker as a treatment of vasovagal syncope is controversial. Although this report cannot conclude that permanent pacemaker is effective in preventing recurrent syncope in cardioinhibitery vasovagal reaction because of the small number of patients and short term follow up, the result in our three patients showed that the permanent pacemaker could delay and lessen the severity of alteration in conciousness during vaso-vagal reaction. The patients with malignant vasovagal syncope may need both artificial pacing and pharmacological treatment, the latter for prevention of recurrence, the former to rescue from syncope in case that medication has failed especially beta-blocker that may prolong asystole.

Acknowledgment

Thanks to the Radiology Department, Chulalongkorn Hospital for providing tilt table and fluoroscopy.

References.

1. Kapoor WN, Karpf M, Wieand S, Peterson JR, Levey GS. A prospective evaluation and follow-up of patients with syncope. N Engl J Med 1983 Jul 23; 309(4) : 197-204
2. Samoil D, Grubb BP. Vasovagal (neurally mediated) syncope : pathophysiology, diagnosis, and therapeutic approach. Eur J Cardiac Pacing Electrophysiol 1992; 4 : 234-41
3. Kenny RA, Ingram A, Bayliss J, Sutton R. Head up tilt : a useful test for investigating unexplained syncope. Lancet 1986 Jan 14; 1(8494) : 1352-54
4. Abi-Samra F, Maloney JD, Fouad - Tarazi FM, Castle LW. The usefulness of head-up tilt testing and hemodynamic investigations in the workup of syncope of unknown origin. PACE Pacing Clin Electrophysiol 1988 Aug; 11(8) : 1202-14
5. Kapoor WN. Diagnostic evaluation of syncope. Am J Med 1991 Jan; 90(1) : 91-106
6. Pongiglione G, Fish FA, Strasburger JF, Benson DW. Jr. Heart rate and blood pressure response to upright tilt in young patients with unexplained syncope. J Am Coll Cardiol 1990 Jul; 16(1) : 165-70
7. Fitzpatrick AP, Theodorakis G, Varqas P, Sutton R. Methodology of head-up tilt testing in patients with unexplained syncope. J Am Coll Cardiol 1991 Jan; 17(1) : 125-30
8. Kapoor WN, Brant N. Evaluation of syncope by upright tilt testing with isoproterenol. A nonspecific test. Ann Intern Med 1992 Mar; 116(5) : 358-63

9. Sheldon R, Killam S. Methodology of isoproterenol- tilt table testing in patients with syncope. J Am Coll Cardiol 1992 Mar; 19(4) : 773-79

10. Fitzpatrick A, Theodorakis G, Ahmed R, Williams T, Sutton R. Dual chamber pacing aborts vasovagal syncope induced by head-up 60° tilt. PACE Pacing Clin Electrophysiol 1991 Jan; 14(1) : 13-9

11. Samoil D, Grubb BP, Brewster P, Moore J, Temesy-Armos P. Camparison of single and dual chamber pacing techniques in prevention of upright tilt induced vasovagal syncope. Eur J Cardiac Pacing Electrophysiol 1993 ; 1(1) : 36-41

12. Sra JS, Jazayeri MR, Avitall B, Dhala A, Deshpande S, Blanck Z, Akhtar M. Comparison of cardiac pacing with drug therapy in the treatment of neurocardiogenic (vasovagal) syncope with bradycardia or asystole. N Engl J Med 1993 Apr 15; 328(15) : 1085-90

13. Glikson M, Hayes D. Recent advances in cardiac pacing. Curr Opin Cardiol 1994 Jan; 9(1) : 65-74