Sudden Cardiac Death in Athlete : A Case Report and Review of Literatures

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ABSTRACT : A 21 yr old man was successfully resuscitated from sudden cardiac arrest during sports training. Cardiac investigations revealed that he had preexcitation syndrome. He was scheduled to cardiac electrophysiologic study and radiofrequency ablation. The bypass tract was located at left posteroseptal site, the procedure was successful. The detailed history and investigations are reported, as well as review of the literatures.

On 14 January 2004, during training for a university games in Nakhonrajaseema, a 21 years old swimmer from Mahidol University told his friend that he had palpitation and unusual dyspnea. He then loss his consciousness and was transferred to the local hospital by his friends and coach. At emergency room the ECG revealed ventricular tachycardia and then turned into ventricular fibrillation, cardiopulmonary resuscitation was successfully performed. Echocardiogram revealed very poor LV contraction and severe hypokinesia of myocardium especially at anterior wall. He developed cardiogenic shock. Intraaortic balloon counterpulsation (IABP) was used to control hemodynamic problem and then he was transferred to Siriraj Hospital.

On admission his vital sign was stable and the ECG showed diffused ST segment elevation as figure 1. The cardiac enzymes were elevated with CK-MB level of 80 mg/dl and troponin T of 2.3 ug/ml. He had leucocytosis (WBC 12,800/mm^3, 89% polymorphonuclear cell) and slight elevation of liver enzyme (AST 120 U/l, ALT 108 U/l) with normal coagulogram (PT 12.6 sec and PTT 28 sec). The differential diagnosis were acute coronary syndrome or acute myocarditis. Coronary angiogram (CAG) was performed with a normal result.

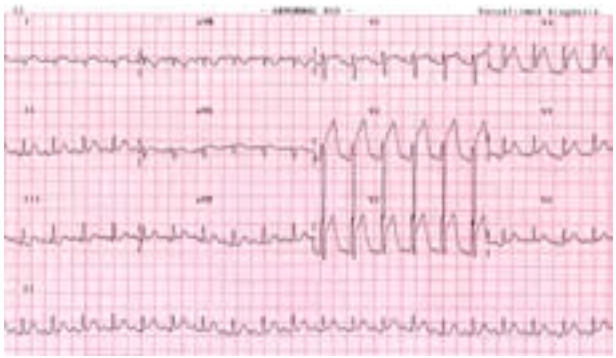

Fig 1. 12-lead ECG on admission

On the second day of admission his hemodynamic was stable with IABP. The IABP could be discontinued on the next day. The ST elevation was resolved but there was minimal preexcitation on ECG as shown on figure 2. His cardiac arrest was suspected to be due to atrial fibrillation with very rapid ventricular response via the bypass tract that degenerated into ventricular fibrillation. Cardiac electrophysiologic study (EPS) was then scheduled.

Fig 2. 12-lead ECG demonstrated preexcitation pattern. There were short PR interval and delta wave suggestive of left posteroseptal bypass tract

Left posteroseptal bypass tract was demonstrated during EPS. Supraventricular tachycardia (SVT) and atrial fibrillation (AF) were induced by programmed stimulation. Radiofrequency ablation (RFA) was performed successfully (fig 3). Follow up echocardiogram which was performed on the seventh day of admission revealed a normal result. He stayed in the hospital for 10 days.

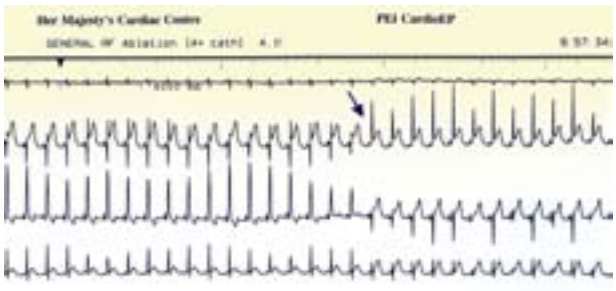

Fig 3. ECG during radiofrequency ablation (leads I, aVF,V1 and V6). The arrow head show where the radiofrequency energy was applied, the arrow demonstrated that there was loss of preexcitation and the QRS complex change morphology

Most sudden cardiac death occurred in the patients with structural heart disease. Coronary artery disease was accounted for approximately 95%[1,2] of cases. The other differential diagnoses are aortic stenosis, cardiomyopathy including hypertrophic cardiomyopathy, and myocarditis. This patient had left ventricular systolic dysfunction and ST segment elevation which suggested that he had acute events such as acute coronary syndrome or

acute myocarditis. However, acute coronary syndrome was unusual for his age and very rapid onset of disease was unusual for acute myocarditis. He had been doing well before the episode and was a sportsman. The possible causes of acute coronary syndrome in the young are nonatherosclerotic causes such as cardiac emboli, hypercoagulable states or anomalous coronary artery. Coronary angiogram was performed to exclude these unusual diseases which gave a normal result. On the second day of admission the ST elevation resolved suggested that it might be resulted from cardiopulmonary resuscitation and prolonged hypoxia.

This young man is an example of sudden cardiac death in apparently normal heart. The differential diagnoses are drugs, long QT syndrome, Brugada syndrome, primary ventricular fibrillation, Wolff-Parkinson-Wite syndrome, acute coronary syndrome from nonathero sclerotic cause, etc. Chuch et al reported an autopsy study that this group of patients accounted for only 5% of sudden cardiac death[2]. However, this is a very important problem because most patients had active life and might have important role in the family. It is also very difficult to identify high risk from low risk patients. There were as many as 6 out of 14 cases that had no identifiable causes of sudden death in this autopsy study. Interestingly, 50% of case sudden cardiac deaths were the first manifestation of disease. There were documented preexcitation in 2 out of 6 ECGs that were available to review. The authors postulated that many patients might have long QT syndrome or idiopathic ventricular fibrillation and he also mentioned that the incidence of preexcitation might be underestimated. In this patient, preexcitation on the ECG suggested that he had sudden death from atrial fibrillation with very rapid ventricular response that degenerated into ventricular fibrillation

Most patients with Wolff-Parkinson-White syndrome (WPW syndrome) had no symptoms and, unlike this patient, it is unusual for cardiac arrest to be the first manifestation of disease. The incidence of sudden cardiac death in patients with WPW syndrome has been estimated to range from 0.15-0.39% over 3-10 years[3]. The predictor of sudden death from retrospective study was shown in table 1. The presence of intermittent preexcitation or loss of preexcitation during procainamide infusion may identify low risk patients. It is important to distinguish intermittent preexcitation from inapparent preexcitation. The former means that there were both preexcited and nonpreexcited QRS complex in the same stripe of ECG recording. If the ECGs are recorded from the different time it is inapparent preexcitation, which is resulted from variation in autonomic tone.

TABLE 1. Predictors of sudden death in WPW syndrome patients[3,4]

Shortest RR interval during atrial fibrillation < 250 msec.
History of symptomatic tachycardia
Multiple accessory pathways
Ebsteinûs anomaly
Familial form of WPW syndrome
Posteroseptally located pathways

Most of these predictors could be identified by history and physical examination but some such as shortest RR interval during atrial fibrillation < 250 msec or multiple accessory pathways might need cardiac electrophysiologic study. There was very little role of noninvasive test to evaluate risk. Considered from the ECG, this young man had left posteroseptal pathway that was a predictor of sudden death.

The treatment of choice for this patient is, undoubtedly, electrophysiologic study and radiofrequency ablation of the bypass tract (fig 4). The more difficult topic to discuss is for asymptomatic patients. WPW syndrome can be easily diagnosed from routine 12-lead ECG. The diagnosis of this young man would have been identified earlier if he had ECG performed before the episode or before entering the sport program. It has been reported that 1/3 of patients who have WPW syndrome and was identified before age 40 will develop symptoms where as no patient in whom preexcitation was first uncovered after age of 40 develop symptoms[3]. Papone et al classified the patients into low and high risk by the arrhythmia inducible during electrophysiologic study[5]. The high risk group was then randomized to have radiofrequency ablation performed or not. They found that most of the high risk patients (77%), which described as arrhythmia inducible, who were randomized to no ablation had symptomatic arrhythmia during 5 years of follow up. They suggested that the role of EPS for risk stratification in asymptomatic WPW syndrome should be considered. However, only 1 patient had sudden death from ventricular fibrillation and only 5 patients had atrial fibrillation with syncope or presyncope.

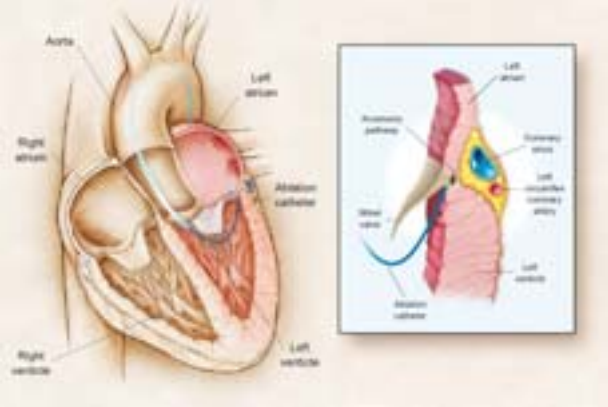

Fig 4. Radiofrequency ablation for left sided bypass tract

Previous studies have reported that the overall complication rate of EPS and RFA of the accessory pathway was about 4.4%[6]. The complete Atrioventricular block and cardiac tamponade rate was 0.17-1% and 0.13-1.1% respectively. The procedure related mortality reported for the catheter ablation of accessory pathway range from 0-0.2%[4]. As mentioned above, the overall incidence of sudden death was low and the procedure may be related to complication, the potential values of electrophysiologic testing in identifying high risk patients who may benefit from catheter ablation must be weighted against the approximately 2% rate of a major complication associated with the procedure. The American heart association/ American college of cardiology recommended to perform EPS and RF ablation in all patients with preexcitation who had symptomatic arrhythmia as class I indication (conditions for which there is evidence and/or general agreement that a given procedure or treatment is useful

and effective). For asymptomatic patients the recommendation was class IIa indication (condition for which there is conflicting evidence and/or divergences of opinion about the usefulness /efficacy of a procedure or treatment)[4]. The factor to consider were the high risk - occupation patients and the patients opinion.

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บทคัดย่อ

การเสียชีวิตฉับพลันในนักกีฬา: รายงานผู้ป่วยและทบทวนวารสาร

สัชชนะ พุ่มพฤกษ์ พ.บ., รุ่งโรจน์ กฤตยพงษ์ พ.บ., วรางคณา บุญญพิสิฏฐ์ พ.บ., ชาญ ศรีรัตนสถาวร พ.บ.

ภาควิชาอายุรศาสตร์, และศูนย์โรคหัวใจสมเด็จพระบรมราชินีนาถ, คณะแพทยศาสตร์ศิริราชพยาบาล, มหาวิทยาลัยมหิดล.

ผู้ป่วยชายอายุ 21 ปี เป็นนักกีฬาว่ายน้ำมหาวิทยาลัยมหิดล มีอาการหมดสติขณะกำลังทำการฝึกซ้อม เมื่อนำส่งโรงพยาบาลตรวจพบว่า ผู้ป่วยมีภาวะหัวใจเต้นผิดจังหวะชนิด ventricular tachycardia และ ventricular fibrillation ได้รับการช่วยคืนชีพทันท่วงที และได้รับการส่งมารักษาต่อที่โรงพยาบาลศิริราช จากการสืบค้นเพิ่มเติมพบว่ามีภาวะกระแสไฟฟ้าลัดวงจรหัวใจ ทำให้เกิดหัวใจเต้นผิดจังหวะชนิดร้ายแรง ผู้ป่วยรายนี้ได้รับการรักษาด้วยการจี้ไฟฟ้าเพื่อสกัดกั้นทางเดินไฟฟ้า หัวใจที่ผิดปกติ การรักษาได้ผลดีและสามารถกลับไปใช้ชีวิตได้ปกติ.