

USE OF CARDIOVERSION IN THE TREATMENT OF VENTRICULAR TACHYCARDIA: A CASE REPORT

by

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Dr. S.M. Shrestha should be congratulated for doing a good and useful work by saving this young patient. This case teaches us three things: firstly, that coronary artery disease is quite common in our part of the world also; secondly, this disease can affect young members of our society even in the early thirties; and thirdly, in such case as presented in this paper, drug is probably of very little value to control the arrhythmia.

It would not be out of place to mention here that I have been looking after this patient since the last 3 years. He also had, on my recommendation, a medical check-up recently at London when he went there for some other work. On return from U.K., a day or two later, while talking with his children, in the morning about 11 A.M., he suddenly got an attack of subternal pain accompanied by a feeling of sinking with sweating and nausea. I was immediately informed of this and I advised parenteral pethidine straightaway.

When I examined him half-an-hour later he was dazed, ashen-grey, groaning with chest pain inspite of pethidine, and sweating profusely. His extremities were cold and clammy. J.V.P. was normal; pulse was about 100 per minute with many missed beats. His B.P. was 70/60, mm. Hg. Heart showed multiple extrasystoles. Lung-Bases were clear. In view of the clinical features and the past history a second heart attack was diagnosed.

The onset of arrhythmia in the early stage was a signal of danger and therefore a strong indication for cardiac monitoring and suitable treatment as and when necessary. As this was possible only in hospital this was strongly recommended; and the family agreed, after much persuasion, with, obviously, very good results!

-- Chief Editor

This is the first report of the use of Synchronised D.C. shock in the treatment of Ventricular tachycardia at Bir Hospital, Kathmandu.

Mr. I.R.S. (39 years) who suffered from the acute posterior myocardial infarct four years back was admitted to the Bir Hospital on 25th April, 1971 (12.1., 2028) in Ventricular tachycardia. He had been in VT for last three hours before he could be admitted to the hospital. Following sudden onset of the arrhythmia he became hypotensive and developed symptoms of myocardial ischaemia and looked very ill. In the hospital his ECG was monitored in the cardioscope. He was given a stat dose and then put on continuous infusion of lignocaine hydrochloride. The drug therapy was ineffective in terminating the

arrhythmia. And the case was referred to me at 11 P.M. By now the patient had been in VT for last ten hours. He was drowsy and on enquiry complained of pain and discomfort over the precordium. His heart rate was 180 per minute, B.P. 70 mm of Hg. systolic. He had developed crepts at both bases. I decided to use Synchronised D.C. shock immediately to terminate the arrhythmia. While the preparation was being made for it I gave a stat dose of Lignocaine 50 mg. I.V.. The drug produced no effect on the rhythm of the heart.

Procedure and the apparatus for Cardioversion:

The apparatus used was a Defibrillator/Synchronizer Model DEC/SYDS (The Corbin-Fransworth). This instrument is devised to administer a direct shock from a 16 microfarad capacitor discharge through a inductance in 2.5 millisecond. The energy used is calibrated in watt-second (Joules). The application of the electric shock of sufficient energy to the closed chest wall to depolarise the heart is too painful to be applied for a conscious patient. So a light anaesthesia was induced by giving Sodium Pentothol 200 mg I.V.. The 'keyed' function selector switch of the Cardiac Synchroniser was turned to 'Manual Synchronising'. The 'Polarity' control was set to + because the R wave in the ECG was above the base line. The Defibrillator external electrode was plugged in and the energy level was set to at 200 wattsecond. Leaving the defibrillator off the synchroniser position was adjusted to fall on the R wave and was checked by depressing the red button on the defibrillator electrode. The defib. was turned in by depressing the power on. The ECG paste was applied on the electrode face and on the patient's chest wall. The positions used on the chest wall were 3rd intercostal space on rt. side and 5th lt. intercostal space at apex anteriorly. The defib. was charged by pushing the red button on the defib. panel. The electrode was held tightly on the patient's chest wall and the shock was delivered by pushing the red button on the electrode. The arrhythmia immediately reverted to sinus rhythm. The heart rate of 180 per minute suddenly dropped to 100 and within few minutes to 80 per minute and the BP rose from 70 mm of Hg. systolic before cardioversion to 100 mm of Hg. The twelve lead ECG taken subsequently and later showed no evidence of fresh infarct.

Discussion:

Ventricular tachycardia may be self-terminating brief paroxysms, or sustained potentially malignant and seriously compromising the systemic pressure and cardiac output (Lown et al, 1964,1967). Corday et al (1959) found in an average fall of 60 per cent in coronary blood flow in dogs during VT. Ventricular tachycardia carries bad prognosis not only because of its deliterious haemodynamic effect and death producing on its own but also because Ventricular fibrillation may occur at any time. In this case the VT was sustained and had caused hypotension and symptoms of myocardial ischaemia.

Before the innovation of electro-conversion the drugs had been the mainstay in the treatment of VT. The drugs that have proved most effective are Lignocaine, Procainamide

and Quinidine. Phenytoin sodium and Bretlium tosylate may be effective in some cases. The use of drugs and their relative value has been reviewed (S.M. Shrestha, 1970). The use of drugs for reversion of ectopic tachycardias to sinus rhythm has many disadvantages and presents several problems (Lown, 1967). In individual patient neither the effective nor the toxic dose can be predicted. And it is essential to use safe increment of the drug under intensive observation of the patient and frequent ECG monitoring. All these antiarrhythmic drugs are cardio-depressant and often their use in high doses or to critically ill patient are associated with undesirable side effects such as depression of cardiac contractility, often with hypotension, and prolonged atrioventricular or interventricular conduction time. The use of Synchronised D.C. Shock in the treatment of tachyarrhythmias is not only safe, rapid and free of side effects, but also the success rate is substantially higher.

The principal of 'Cardioversion' is the momentary depolarisation of the heart with the abolition of abnormal circuit. The sinus node having the highest degree of automaticity within the heart then resumes as the dominant pacemaker (Lown, 1967).

Synchronised D.C. Shock was first successfully used by Lown to treat a seriously ill patient in VT resistant to drugs, at the Peter Bent Brigham Hospital, Boston. This method was found effective and safe in 95 to 97 per cent of the cases of VT (Lown et al, 1967 and De Sanctis, 1965). The only disadvantage of this method is that the equipment may not be available at all places and its use requires anaesthesia.

In the coronary care unit where the facilities are available this method may be used as the first line of treatment in preference to drugs. However, the comparatively safe drug like lignocaine may be used initially. And if the initial use of the drug is not effective no time should be lost in employing electrical reversion of the rhythm. It is not justifiable to use depressant drugs to the point of toxicity when such an effective and safe method of therapy as electrical conversion is available (Shrestha, 1970). In case of moribund patient the therapy of choice is D.C. Shock and should be used immediately and without anaesthesia. The only contra-indication to the use of D.C. Shock is the digitalis induced VT, where the drugs like lignocaine should be used. The D.C. Shock in such circumstance is liable to induce VT (Lown).

Historical Consideration:

Bernard Lown has reviewed the history of the development of the 'Cardioversion' in the treatment of tachyarrhythmias in his "Thomas Lewis" lecture delivered on Nov. 26, 1965, before the Cardiac Society of London.

Prevost and Battelli in 1899 first used strong electric current directly to the heart of the dog to induce VF. They also noted that it was capable of terminating VF (Circulation Research, 1967, Vol. XXI No 6, page 848), Kouwenhoven. Hooker and Langworthy (1933) clearly defined the use of electric defibrillation of the heart. They used A.C. current and

the electrode paddle was applied directly to the heart. Beck, Pritchard and Feil (1947) first successfully used defibrillation in man. Zoll et al (1956) later demonstrated the effectiveness of the transthoracic A.C. discharge in defibrillation of the human heart. The pioneering work of Gurvich and Yuniyev (1946,1947) in the Soviet Union laid the basis for the use of direct current or capacitor discharge (D.C.). Lown's extensive and painstaking experiments opened the way to the use of D.C. Shock in terminating arrhythmias besides VF.

It was noted that D.C. Shock produced VF when the discharge fell during the inscription of the initial portion of the T wave. This brief vulnerable period is the physiological property of the mammalian including human heart. Lown, Amersingham and Newman (1962) by employing a capacitor discharge with a specific underdamped pulse and synchronising the release of this pulse with a safe part of the cardiac cycle, became successful in avoiding the twin dangers of electricity, namely, the ventricular standstill and fibrillation, and thus made it possible to employ the electric current for terminating a diversity of ectopic arrhythmias. And they designated the method "Cardioversion." Cardioversion was first used in 1961 to convert ventricular tachycardia to sinus rhythm.

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