TEMPORARY CARDIAC PACING AT THE BEDSIDE

NG TIAN SENG

SUMMARY

Temporary cardiac pacing is an established therapeutic modality in the treatment of heart block and bradyarrythmias due to various causes like drugs and metabolic causes and prior to permanent pacing. Temporary pacing using fluoroscopy is best but the image intensifier is not available to all medical units. The method of temporary pacing at the bedside is described in detail.

INTRODUCTION

It is now over two and half decades since permanent cardiac implants became routine for patients with complete heart block. The use of temporary cardiac pacing to treat various medical conditions where the predominant problem is a bradyarrythmia is well established.[1,2]

There are various causes of heart block like myocardial infarction, acute non-specific myocarditis, hyperkalaemia, and others which may present in the medical wards from time to time.

The ability to pace the ventricles can be lifesaving at times. The use of underdrive or overdrive pacing can be effective in terminating various tachyarrythmias without resorting to defibrillatory shock. In this paper we present our results where ventricular pacing was carried out for complete block.

Ng Tian Seng MBBS (S'pore), MRCP(UK), FRACP
Consultant Physician
Hospital Besar,
Alor Setar, Kedah

We describe here the details of temporary bedside cardiac pacing for complete heart block which can be extended to pacing the ventricle or atrium where the need arises.

METHOD

The equipment required are (1) a bedside cardiac monitor (2) a defibrillator (3) an ECG machine preferably powered by battery (4) three crocodile clips (5) external pulse generator (6) temporary pacing electrodes and (7) a cutdown set. The cutdown set may include various cannulae introducer systems. We are only describing here the system where the cannula supplied with the temporary electrodes are adequate for venepuncture. The femoral, brachial, jugular, and subclavian veins provide various options to allow access for the electrodes to be placed at the ventricular apex. The femoral and brachial veins offer ease of access but are not stable if the patient moves. The jugular and subclavian are both convenient and allow movement but is technically more difficult to cannulate. We use the subclavicular approach to the subclavian vein exclusively even though the potential for pneumothorax, haemothorax and subclavian artery punctures occur now and then. It is only when we fail to cannulate the subclavian that the other options are considered.

The patient is connected to a bedside monitor using disposable chest electrodes. The ECG machine is also connected to the patient in the usual way. As the subclavian approach is desired the bed is tilted so that the patient is in the Trendelenburg position using bed blocks where necessary. The patient is then ready after the right side of the neck and upper chest are cleaned with "Pevidine" or spirit and iodine. If the

patient is alert, 1% lignocaine is used as local anaesthetic and is injected into the subclavicular region. If free flowing blood is aspirated the cannula is advanced or a guidewire inserted and the introducer with cannula passed in the usual way. The electrode wire is then passed into the subclavian vein through the cannula. As it is usual to use bipolar electrodes for temporary pacing the distal electrode is connected to the V lead of the ECG. The right atrial electrogram is shown in Figure 1. The high atrium will have an inverted P wave which becomes biphasic in midatrium and upright in the low atrial region.[3,4] The electrode is now manipulated until it enters the right ventricle. This part of the procedure can take up quite a while but with the advent of the balloon catheters is much less of a hassle now. When the ventricle is entered the QRS becomes very large and the ECG standardisation has to be halved (See figure 2). The electrode is moved till a good contact with the endocardium is made when a large current of injury is recorded with a marked ST segment elevation. The monitor will now record frequent extrasystoles and sometimes a run of extrasystolic ventricular tachycardia.

When satisfactory contact of the distal electrode with the endocardium is made, a recording with the proximal electrode connected to the V lead is made to see whether it is also in the ventricle. The ability to sense the electrical signals is checked by recording the synthetic lead 1 which merely means connecting the proximal and distal electrodes to lead 1. A voltage of 3mV or more is usually adequate. Usually the electrode is at or near the ventricular apex but sometimes the electrode is coiled but the contact is good and pacing can be carried out in a satisfactory manner.

The electrode is now connected to the external pulse generator. The rate is set about five beats above the patient's rate and the current increased till a one to one capture is obtained and rechecked by decreasing the current till capture is lost. The stimulation threshold should be 1mA or less. If the threshold is too high the electrode should be repositioned. The output of the pacer is usually set at 2 or 3 times the threshold to ensure capture.

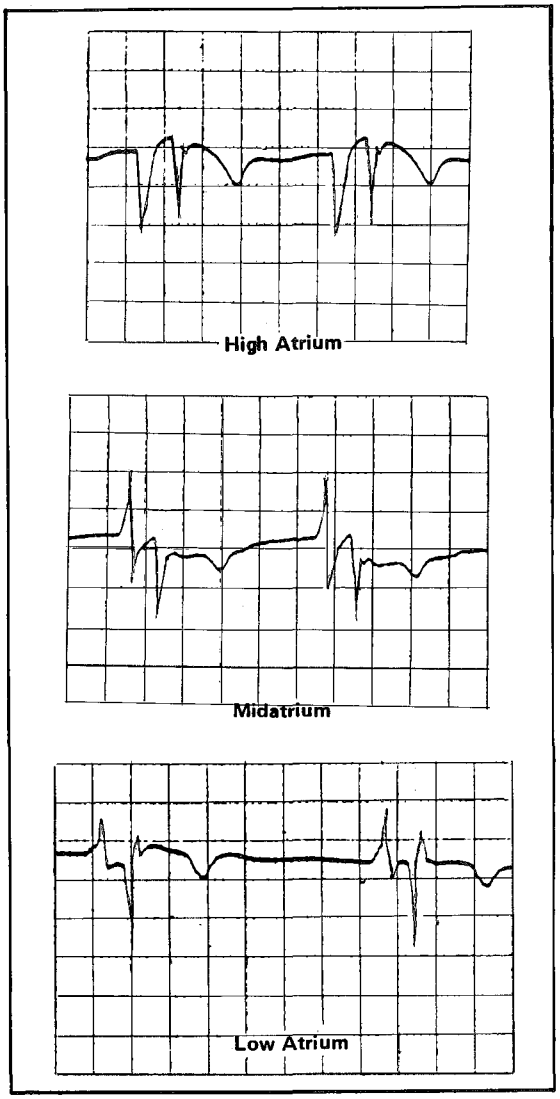

Figure 1 Position of catheter tip in atrium.

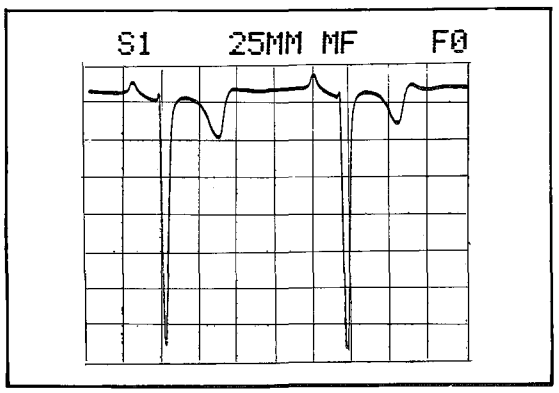

Figure 2 Electrode in ventricle.

The demand mode is used as this will prevent competitive pacing should the intrinsic rhythm return. When adequate sensing is lost the bipolar electrode can be converted into a unipolar one by joining the positive output of the pacer to a needle embedded in the patients skin usually of the forearm. We find that this is the exception rather than the rule. The rate is usually set at 70 per minute and a full 12 lead ECG taken. A left bundle branch block will be recorded. A R1R2S3 pattern is very suggestive that the electrode is at or near the apex though this is not invariable. A portable chest X-ray is taken to check the electrode postion and to look for pneumothorax. We have usually found that the electrode is near the apex but we have successfully paced patients when the contact of the electrode with the endocardium is good but the electrode is not at the apex. For those who are not familiar with the subclavian approach the branchial vein is very easy to cannulate but displacement of the electrode is common and to prevent this the arm has to be immobilised which is uncomfortable.

RESULTS

We have the records of 23 cases done in Ipoh General Hospital and 21 in Alor Setar General Hospital. In this series of 44 cases there was only one case where infection occurred because of repeated repositioning over a 3 day period. There were no cases of venous thrombosis. Our longest placement was eight days. No cardiac perforation occurred probably because more than half died despite pacing. No antibiotics were given to any of these patients.

The details of the indications for pacing are given in Table I.

TABLE I
PACING FOR BRADYARRHYTHMIA

Indication for pacing bradyarrhythmia	No.
Complete Heart Block (Idiopathic)	9
C.H.B. (Hyperkalaemia)	1
C.H.B. (Myocardial Infarct)	21
C.H.B. (Acute non-specific carditis)	4
Sick Sinus Syndrome	8
Operative destruction of Sinus node	1
Total	44

DISCUSSION AND CONCLUSION

Temporary cardiac pacing is a simple way of treating complete heart block. Unlike drugs it is independent of dosage and is very reliable if the electrode is well positioned. This modality of treatment should be available in most medical units as it does not require sophisticated instrumentation and the procedure is relatively simple. It is also quite satisfying to see a patient stop fitting once the electrode is in place. In cases of myocarditis or metabolic causes like hyperkalaemia it is superior to the use of drugs. It is well known that most antiarryhthmia drugs have proarryhthmic potential and some of the arryhthmias produced are easily treated by pacing till the level of the drug is lowered. It is bad practice to try to suppress these arryhthmias with more drugs.

Pacing the atrium for short periods is very easy and this is made use of when patients have a supraventricular tachycardia which is amenable to either overdrive or underdrive pacing e.g. atrial flutter or reentrant tachycardias. However, this generally is less common in medical wards as compared to bradyarrhythmias or complete heart block.

CONCLUSION

A simple bedside method for temporary cardiac pacing is described in great detail. This method was used in the West a long time ago when fluoroscopy units were not so freely available as it is now.[5,6] The same conditions are present in most of our medical units at present and to move an ill patient to an X-ray department may mean that the patient may not arrive alive. It is not feasible to provide protable C-arm image intensifiers to all medical units even though this is the only alternative to moving the patient.

ACKNOWLEDGEMENTS

The author wishes to thank the Ketua Pengarah Kesihatan, Malaysia, for permission to publish this report. The sisters and nurses in both Ipoh and Alor Setar and the doctors in the author's unit have been most cooperative and helpful. He is also grateful to Cik Maimunah bt Othman for typing the manuscript.

REFERENCE

1 Parsonnet, Victor, Zucker, I. Richard, Gilbert, Lawren and Asa, M. Maxin. An Intracardiac Bipolar Electrode for Interim Treatment of Heart Block. *Amer J Cardiol* 1962; 12 : 261 – 265.

2 Harris, Charles W., Hurlfurt, James C., Floyd, Walter L. and Orgain, Edward S.: Percutaneous Technic for Cardiac Pacing with a Platinum-Tipped Electrode Catheter. *Amer. J. Cardiol,* 1965 : 15 : 48 – 50.

3 Bertrand, Charles A., Zohman, Leuore. R. and W Williams, M. Henry. Intracardiac Electrocardiography in Man *Amer. J. Med,* 1959; 26 : 534 – 541.

4 Evans, Gerald L. and Glossar, Stephen P. Intracavitory Electrocardiography as a Guide to Pacemaker Positioning. *JAMA,* 1971; 216 : 483 – 485.

5 Kimball, John T. and Killip, Thomas. A simple Bedside Method for Transvenous Intracardiac Pacing. *Amer Heart J,* 1965; 70 : 35 – 39.

6 Baird, Charles L. Transvenous Pacing – a Bedside Technique. *Br Heart J., 1971; 33 : 191 – 192.*