

INTRODUCTION

Cardiac arrhythmia is a common complication of acute myocardial infarction and may precede cardiac arrest or complicate the early post resuscitation period.

Rhythm disturbance may also present in many other ways and be unrelated to coronary heart disease.

The management of disorders of cardiac rhythm is a specialised subject often requiring detailed investigation and management strategies that are not available outside hospital.

Diagnosis of the precise rhythm disturbance may be complicated and the selection of optimal treatment difficult. Very often, expert advice will be required, yet this expertise is rarely immediately available in the emergency situation.

PRINCIPLES OF TREATMENT

Management is determined by the condition of the patient as well as the nature of the rhythm.

In all cases give high concentration oxygen and gain venous access.

Always take a defibrillator to any patient with suspected cardiac rhythm disturbance.

Establish cardiac rhythm monitoring as soon as possible.

Document the arrhythmia. This should be done with a 12 lead ECG whenever possible. Provide a printout for the hospital, and if possible archive the record electronically so that further copies can be available at a later time if needed. Repeat the recording if the rhythm should change at any time. Record the ECG rhythm during any intervention (vagotonic procedures or the administration of drugs).

If patients are not acutely ill there may be time to seek appropriate advice.

The presence of adverse signs or symptoms will dictate the need for urgent treatment. The following adverse factors indicate a patient who is unstable because of the arrhythmia:

- evidence of low cardiac output: pallor, sweating, cold clammy extremities, impaired consciousness or hypotension (SBP <90mmHg)
- excessive tachycardia, defined as a heart rate of >150bpm
- excessive bradycardia, defined as a heart rate of <40bpm

- heart failure implies the arrhythmia is compromising left ventricular function. This may cause breathlessness, confusion and hypotension or other features of reduced cardiac output
- ischaemic chest pain implies that the arrhythmia (particularly tachyarrhythmia) is producing myocardial ischaemia. It is particularly important if there is underlying coronary disease or structural heart disease in which ischaemia is likely to lead to life threatening complications including cardiac arrest.

1. BRADYCARDIA

Introduction

A bradycardia is defined as a ventricular rate below 60bpm, but it is important to recognise patients with a relative bradycardia in whom the rate is inappropriately slow for their haemodynamic state.

ASSESSMENT

Assess for adverse signs present (*see below*).

Assess for risk of asystole (*see below*).

MANAGEMENT

If one or more adverse signs are present (*see Appendix 1*):

- systolic blood pressure <90mmHg
- ventricular rate <40bpm
- ventricular arrhythmias compromising BP or requiring treatment
- heart failure.

Give high concentration oxygen and gain IV access. Give atropine 500mcg IV and repeat after 3–5 minutes if necessary up to a total of 3 milligrams.

CAUTIONS

Doses of atropine lower than 500mcg may paradoxically cause further slowing of ventricular rate. Use atropine cautiously in acute myocardial ischaemia or infarction; an increased rate may worsen ischaemia.

2. RISK OF ASYSTOLE

If the patient is initially stable (i.e. no adverse signs are present) or a satisfactory response is achieved with atropine, next determine the risk of asystole. This is indicated by:

- previous episode of asystole
- Mobitz type II AV block
- complete (third degree) AV block, especially with a broad QRS complex or an initial ventricular rate <40bpm
- ventricular standstill >3 seconds.

If there is a risk of asystole, (i.e. one or more of these signs is present), or the patient shows adverse signs and has not responded satisfactorily to atropine, transvenous pacing is likely to be required. One or more of the following interventions may improve the patient's condition during transport:

- transcutaneous pacing should be undertaken if available
- If transcutaneous pacing is not available:
 - fist pacing may produce ventricular contraction. Give serial rhythmic blows with the closed fist over the lower left sternal edge to pace the heart at a rate of 50–70bpm
 - adrenaline boluses may be given to maintain cerebral perfusion.

NOTES

- a. Do not give atropine to patients with cardiac transplants; paradoxical high degree AV block or sinus arrest may result.
- b. Complete heart block with a narrow QRS complex escape rhythm is not an absolute indication for pacing. The ectopic pacemaker (which is situated in the atrioventricular junction) may provide a stable rhythm at an adequate rate.
- c. Initiate transcutaneous pacing (if equipment is available):
 - if there is no response to atropine
 - patient is severely symptomatic, particularly when high degree block (Mobitz type II or third degree AV block) is present.

NOTE: Transcutaneous pacing may be painful; use analgesia. Verify mechanical capture. Monitor the patient carefully; try to identify the cause of the bradycardia.

3. TACHYCARDIA

Introduction

These guidelines are intended for the treatment of patients who maintain a cardiac output in the presence of the tachycardia.

Pulseless tachycardia is treated with immediate attempts at cardioversion following the algorithm for the treatment of pulseless VT/VF.

MANAGEMENT (see Appendix 2)

1. Support the ABCs.
2. Give high concentration oxygen and gain IV access.
3. Establish cardiac rhythm monitoring.
4. Record and monitor BP and SpO₂.
5. Record a 12-lead ECG if possible, if not, record a rhythm strip.
6. If the rhythm changes at any time, make a further recording.
7. Make a continuous record of the rhythm during any therapeutic intervention (whether a drug or physical manoeuvre like carotid sinus massage).
8. The response to treatment can provide important additional information about the arrhythmia.
9. Identify and treat reversible causes; give analgesia if indicated.
10. Try to define the cardiac rhythm from the ECG. Determine the QRS duration and determine whether the rhythm is regular or irregular. If the QRS duration is 120msec or more the rhythm is a broad complex tachycardia. If less than 120msec, the rhythm is a narrow complex tachycardia.

4. BROAD COMPLEX TACHYCARDIA

- The rhythm is likely to be ventricular tachycardia, particularly in the context of ischaemic heart disease, patients showing adverse signs (reduced consciousness, SBP <90mmHg, chest pain or heart failure), or in the peri-arrest situation.
- In all cases, maintain the supportive measures above and monitor the patient during transport.
- Provide a pre-alert message according to local protocols.

Atrial fibrillation conducted aberrantly may produce an irregular broad complex tachycardia, but the diagnosis is difficult to make with certainty and often requires expert examination of the ECG. This emphasises the importance of recording the ECG when the arrhythmia is present. Ambulance personnel may greatly assist the subsequent diagnosis and management of patients by obtaining good quality ECG recordings. It is advantageous if these can also be archived electronically so that additional copies are available in the future. It is frustratingly common for paper copies of ECGs to be lost after admission to hospital.

5. NARROW COMPLEX TACHYCARDIA

If the rhythm is narrow complex (QRS <120 msec) **AND REGULAR**, it is likely to be either:

- Sinus tachycardia. This is a physiological response, for example to pain, fever, blood loss or heart failure. Treatment is directed towards the cause. Trying to slow the rate is likely to make the situation worse.
- Supraventricular tachycardia (SVT). This is often seen in patients without other forms of heart disease. There may be a history of previous attacks.
- Atrial flutter with regular AV conduction (often 2:1 and a rate of 150bpm).

If sinus tachycardia is absent, start with vagal manoeuvres. In some cases the patient may be aware of techniques that have terminated previous episodes. The Valsalva manoeuvre (forced expiration against a closed glottis) may be effective and is conveniently achieved (especially in supine patients) by asking the patient to blow into a 20ml syringe with sufficient force to push back the plunger. If this fails, perform carotid sinus massage *provided no carotid bruit is heard on auscultation*. A bruit may indicate the presence of atheromatous plaque, rupture of which may cause cerebral embolism and stroke.

Record the ECG (preferably multi-lead) during each manoeuvre. If the arrhythmia is successfully terminated by vagal procedures, it is very likely to have been SVT. If the rhythm is atrial flutter, slowing of ventricular rate may occur and allow the identification of flutter waves on the ECG.

Maintain the supportive measures above and monitor the patient during transport.

AN IRREGULAR narrow complex rhythm is most commonly atrial fibrillation, less commonly atrial flutter with variable block. Maintain the supportive measures above and monitor the patient during transport.

In all cases, ensure the patient is received into a suitable high dependency unit maintaining cardiac monitoring throughout. Ensure detailed hand-over to appropriate staff and that ECGs are safely handed over.

Key Points – Cardiac Rhythm Disturbance

- In all cases give high concentration oxygen.
- Gain venous access.
- Always take a defibrillator to any patient with suspected cardiac rhythm disturbance.
- Establish cardiac rhythm monitoring as soon as possible preferably with a 12-lead ECG.
- Record the ECG rhythm during any intervention and archive. Ensure all ECGs are safely handed over to receiving staff and archive so further copies can be retrieved if necessary.

BIBLIOGRAPHY

- ¹ Committee M, Blomstrom-Lundqvist C, Scheinman MM, Aliot EM, Alpert JS, Calkins H, et al. ACC/AHA/ESC guidelines for the management of patients with supraventricular arrhythmias—executive summary: A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and the European Society of Cardiology Committee for Practice Guidelines (Writing Committee to Develop Guidelines for the Management of Patients With Supraventricular Arrhythmias) Developed in collaboration with NASPE-Heart Rhythm Society. *Eur Heart J* 2003;24(20):1857-1897.
- ² Guidelines for the management of patients with atrial fibrillation. A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and the European Society of Cardiology Committee for Practice Guidelines and Policy Conferences (Committee to develop guidelines for the management of patients with atrial fibrillation) developed in collaboration with the North American Society of Pacing and Electrophysiology. *Eur Heart J* 2001;22(20):1852-1923.

METHODOLOGY

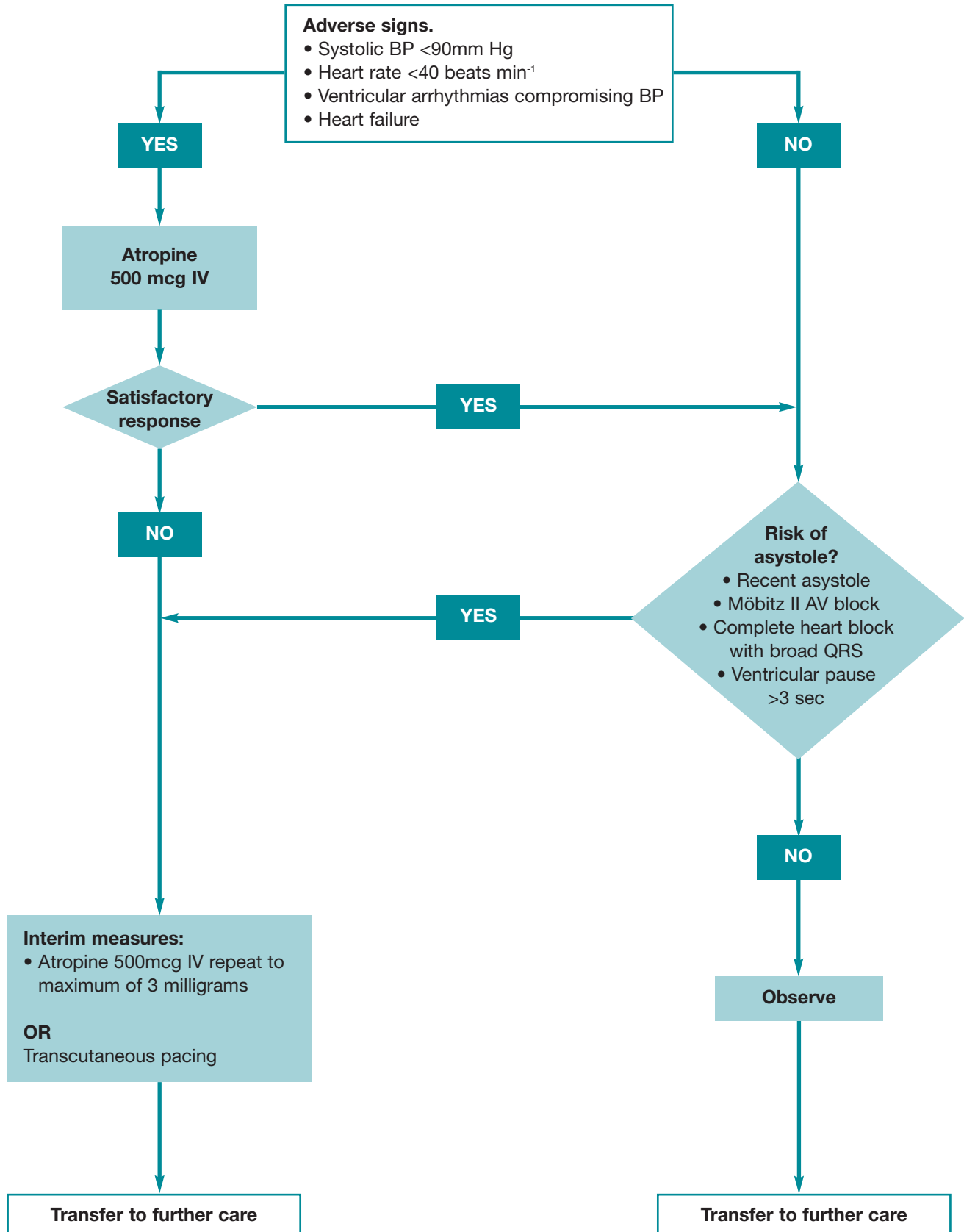
The methodology describing the development process of the international cardio-pulmonary resuscitation treatments recommendations on which this guideline is based is fully described in the publications listed below.

Morley PT, Zaritsky A. The evidence evaluation process for the 2005 International Consensus Conference on cardio-pulmonary resuscitation and emergency cardiovascular care science with treatment recommendations. *Resuscitation* 2005;67(2-3):167-170.

Zaritsky A, Morley PT. The Evidence Evaluation Process for the 2005 International Consensus Conference on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations. *Circulation* 2005;112(22_suppl):III-128-130.

APPENDIX 1 – Bradycardia Algorithm

If appropriate, give oxygen, cannulate a vein and record a 12-lead ECG.



APPENDIX 2 – Tachycardia Algorithm

