

We found that a history of myocardial infarction, axis shift during tachycardia, and the QRS configuration in lead V1 were the independent predictors of the origin of a broad complex tachycardia. The QRS configuration in lead aVF also seems to be both an important univariate and independent multivariate predictor of the origin of a broad complex tachycardia, but this needs prospective confirmation.

The statistics in this study were performed in conjunction with John Micklewright, PhD, lecturer in microeconometrics at Queen Mary's College and Associate Professor, University of Florence. His specialty is the application of statistics to small population groups.

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## NOTICES

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### 1991

**The Fourth Annual International Symposium on New Technologies in Cardiovascular Ultrasound** will be held at the Mayo Clinic, Rochester, Minnesota, USA, on 15 to 18 September (Satellite Teleconference: Mayo Jacksonville, Mayo Scottsdale, Sao Paulo, Brazil, and Buenos Aires, Argentina): Fax 507 284 0532; Tel 507 284 2509 or 1 800 323 2688.

**The Fifth International Workshop on Future Directions in Interventional Cardiology** will be held in Santa Barbara, California, on 20 to 22 September: The American College of Cardiology, 9111 Old Georgetown Road, Bethesda, MD 20814, USA (Fax: 301 897 9745; Tel: 301 897 2695).

**The Third International Workshop on Magnetic Resonance Angiography** will be held in L'Aquila on 13 October: Scientific Secretariat, Dr Paolo Pavone, Department of Radiology, University of L'Aquila, Ospedale Collemaggio, 67100 L'Aquila, Italy (Fax: 39 862 410997; Tel: 39 862 26164).

**The First Symposium on Magnetic Resonance Imaging of the Cardiovascular System** will be held in Rome on 14 to 16 October: Scientific Secretariat, Dr Paolo Pavone, Department of Radiology, University of L'Aquila, Ospedale Collemaggio, 67100 L'Aquila, Italy (Fax: 39 862 410997; Tel: 39 862 26164).

**An International Symposium and Workshop on Transoesophageal Echocardiography in Congenital Heart Disease** will be held in Edinburgh on 23 and 24 November: The Secretary, Symposium "TEE in Congenital Heart Disease", Department of Paediatric Cardiology, Royal Hospital for Sick Children, Sciennes Road, Edinburgh EH9 1LF.

### 1992

**The Annual Meeting of the British Cardiac Society** will take place at the Harrogate International Centre on 26 to 29 May.

**The Ninth International Congress of Histochemistry and Cytochemistry** will be held in Maastricht on 30 August to 5 September: Organising Secretariat, Professor F C S Ramaekers, Department of Molecular Cell Biology, University of Limburg, PO Box 616, 6200 MD Maastricht, The Netherlands (Fax: 31 43 437640; Tel: 31 43 888642).

## Appendix

### Summary of commonly used pacemaker modes

#### AAI—Single chamber atrial pacing

**Indications:** —Sinoatrial node disease without atrioventricular block and without failure to increase rate on exercise.

**Contraindications:** —Atrioventricular block.  
—Persistent atrial tachyarrhythmias.  
—Carotid sinus and vasovagal syndromes.  
—Sinoatrial node disease with failure to increase rate on exercise.

**Advantages:** —Simple system using standard single atrial lead and standard multiprogrammable single chamber pacemaker.  
—Atrioventricular synchrony maintained.

**Disadvantages:** —No rate response on exercise.  
—No protection against atrioventricular block.

#### AAIR—Single chamber atrial pacing with rate response

**Indications:** —Sinoatrial node disease without atrioventricular block with failure to increase rate on exercise.

**Contraindications:** —As for AAI mode.

**Advantages** —Single atrial lead with standard pacemaker programmed to AAI mode with an additional rate adaptive sensor.  
—Atrioventricular synchrony maintained.

**Disadvantages:** —No protection against atrioventricular block.  
—Atrioventricular block not present at rest may develop at faster pacing rates due to mismatch between sensor determined pacing rate and autonomic nervous system influences on the atrioventricular node.  
—Inappropriately long atrioventricular conduction times on exercise may result in pacemaker syndrome.<sup>51</sup>  
—Some rate adaptive sensor systems require a special pacemaker lead.

#### VVI—Single chamber ventricular pacing

**Indications:** —Atrial fibrillation/flutter with atrioventricular block or slow ventricular response.

**Contraindications:** (a) Sick sinus syndrome.  
(b) Carotid sinus syndrome.  
(c) Vasovagal syncope.

**Advantages:** —Single ventricular lead with standard pacemaker.

**Disadvantages:** —When used in the presence of normal atrial activity pacemaker syndrome is commonly caused by retrograde atrioventricular conduction.  
—Loss of atrial synchrony may cause symptoms when used in the presence of normal atrial activity.

#### VVIR—Single chamber ventricular pacing with rate response

**Indications:** —As for VVI mode.

**Contraindications:** —As for VVI mode.

**Advantages:** —Rate response on exercise.

**Disadvantages:** —Pacemaker syndrome due to retrograde atrioventricular conduction.  
—Loss of atrioventricular synchrony.  
—Some rate adaptive sensor systems require a special pacemaker lead.

#### DDI—Dual chamber pacing without atrial tracking

**Indications:** —Sick sinus syndrome.  
—Carotid sinus syndrome.  
—Vasovagal syncope.

**Contraindications:** —Isolated atrioventricular block.  
—Persistent atrial tachyarrhythmias.

**Advantages:** —Maintenance of atrioventricular synchrony.  
—Protection from co-existent atrioventricular block.  
—No pacemaker mediated tachycardias.<sup>37</sup>  
—No tracking of atrial tachyarrhythmias.

**Disadvantages:** —No rate response.  
—Two pacemaker leads required.  
—Problems with retrograde atrioventricular block conduction not completely eliminated.<sup>52</sup>

#### DDIR—Dual chamber pacing without atrial tracking, but with a rate adaptive sensor facility

**Indications:** —Sick sinus syndrome.

**Contraindications:** —Isolated atrioventricular block.  
—Persistent atrial tachyarrhythmias.

—Rate responsiveness not necessary in carotid sinus and vasovagal syndromes as this function is maintained naturally in these patients.

**Advantages:** —Maintenance of atrioventricular synchrony.  
—Rate response on exercise.  
—No pacemaker mediated tachycardia.  
—No tracking of atrial tachyarrhythmias.

**Disadvantages:** —Two pacemaker leads required.  
—Problems with retrograde atrioventricular conduction not completely eliminated.<sup>52</sup>

**DDD**—Dual chamber pacing with rate response due to atrial tracking

**Indications:** —Atrioventricular block with normal sinus node function.

**Contraindications:** —Persistent atrial tachyarrhythmias.

**Advantages:** —Restoration of atrioventricular synchrony.  
—Rate response on exercise.

**Disadvantages:** Complex pacemaker requiring sophisticated followup.  
—Two pacing leads required.  
—Pacemaker mediated tachycardia may occur if retrograde P wave falls outside the atrial refractory period.<sup>53 54</sup>  
—No rate response if sinoatrial node rate does not increase on exercise.  
—Prolongation of atrial refractory period to prevent pacemaker mediated tachycardia results in lowering of the maximum attainable tracking rate and a rare possibility of pacemaker syndrome owing to retrograde atrioventricular conduction.<sup>55</sup>  
—Behaviour of the pacemaker at the maximum tracking rate may be physiologically inept—for example, sudden development of 2:1 at atrioventricular block.

*Many of these disadvantages can be overcome by careful programming of the pacemaker.*

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**VDD**—Ventricular pacing responding to atrial tracking

**Indications:** —As for DDD.

**Contraindications:** —As for DDD.

**Advantages:** —As for DDD.

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**Advantages—cont** —Single pass atrioventricular lead may be used which is adequate for sensing P waves but cannot pace the atria.

**Disadvantages:** —As for DDD.  
—Pacemaker behaves as VVI system at lower tracking rates, increasing the chances of . . .  
—Pacemaker syndrome and pacemaker mediated tachycardia.

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**DDDR**—Dual chamber pacing with atrial tracking and additional rate adaptive sensor

**Indications:** —Atrioventricular block.  
—Sick sinus syndrome, especially if the sinoatrial node fails to increase its rate on exercise.

**Contraindications:** —Persistent atrial tachyarrhythmias.

**Advantages:** —Maintenance of atrial synchrony.  
—Atrial tracking when feasible.  
—Additional rate adaptive facility.

**Disadvantages:** —Complex programming and follow up.  
—Two pacing leads required.

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**General considerations in rate adaptive sensor driven systems**

**Advantages:**  
Rate response on exercise independent of sinus node activity.

**Disadvantages:**  
Sensor may require a special pacemaker lead.  
Some sensor systems are based on less physiological measurements than others.  
Sensor may be inappropriate in an individual patient (for example activity sensor in a bedbound patient; minute volume sensor in a patient with chronic lung disease).

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