Optimising the Management of Post-Surgical Temporary Pacing Care

A Novel Cardiac Physiology Led Service

Dan Meese, Kamila Stachurska, Shouvik Haldar, Stephanie Barrett, Ian McGovern, David Jones, Wajid Hussain, Mark Mason and Rebecca Lane
Cardiac Surgery in the UK

- 42 centres in the UK performing cardiac surgical procedures
- Approximately 35,000 cardiac surgical procedures performed each year*
- 90-100% of patients have temporary epicardial pacing

*Data taken from the Society for Cardiothoracic Surgery (SCTS) in Great Britain and Ireland website – https://SCTS.org 2016
Reasons for Temporary Pacing

- **Causes of Post-Surgical Bradycardia**
  - Ischemia caused by cardioplegia
  - Increased vagal tone post surgery
  - Suppressed Baroreflex Sensitivity
  - Medication
    - Sedative and analgesia
    - Anti-arrhythmic
  - Trauma to the AV node

Temporary pacing is used to stabilise arrhythmia until the insult passes.
Risks of Temporary Pacing

- Arrhythmia
  - Tachycardia
  - Bradycardia
- Suboptimal Haemodynamics
  - Increased used of Inotropes
  - Additional fluids when not required
Study undertaken by Elmi et al (2002) reviewed epicardial lead degeneration post surgery

Authors found:
- Significant increases in threshold by day 4 with loss of capture at day 5
- Significant deterioration of P wave and R wave amplitudes by day 2

The authors concluded that “Although both atrial and ventricular temporary epicardial leads are reliable for short-term use, their function deteriorates on a daily basis.”

Temporary epicardial pacing needs to be assessed on a daily basis
Generally managed by Anaesthetists/Intensivists and ITU nurses
Why Not Cardiac Physiologists?

- 3-4 years training as a student physiologist
  - Includes time spent in pacing clinic
- Highly skilled in Pacing function and rhythm recognition
- Many years experience of pacing troubleshooting

- Professional qualifications in pacing
  - BHRS (HRUK)
  - IBHRE
- Deep understanding of the physiology of cardiac pacing
  - AV delays and other timings
    - Encouraging intrinsic conduction where possible
  - Importance of correct device optimisation
    - Correct mode
Temporary Pacing at Harefield Hospital

- Daily rota for band 6/7 physiologists
- Patients seen 1 day post procedure until device is detached
  - Basic pacing parameters measured
  - Device optimisation
- On call for Temporary Pacing 24/7
  - Arrest bleep
- Educational sessions for staff from ITU and other surgical wards
Validation of the Service

*Audit conducted looking at the need for Physiology led service

- How many patients required programming changes at first contact with Physiologist?
- What was the most common programming change at first contact and why?
- Time from first admission to ITU post-surgery to first contact with cardiac physiology?

*Audit data collected and reviewed by Kamila Stachurska, Harefield Hospital (2017)
Methods

- Retrospectively reviewed 229 patients with temp pacing post surgery
- Patients identified using temporary pacing database and ITU recording system
- 127 male, aged 64 (±16.38)
- All types of cardiac surgery
- Patients underwent surgery between 2015 - 2017
Predefined Criteria for Programming Changes

- Safety margin not met
  - Outputs set at $2 \times$ threshold
  - Sensitivity set at half of measured signal
- Loss of Capture
  - Loss of capture in either/both A and V
- Undersensing
  - Inappropriate pacing in either/both A and V
- Oversensing
  - Inappropriate inhibition in either/both A and V
- Incorrect mode
  - Mode incorrect for underlying rhythm
  - Mode changed to encourage intrinsic R wave
- Incorrect rate
  - Rate too slow or too fast, leading to suboptimal haemodynamic response
- AV delay
  - AV delay extended to encourage intrinsic R wave
Our findings... Device Changes at First Contact

- **98/229 (43%)** required a programming change at the first point of contact with the cardiac physiologist.
- **54 (24%)** patients required more than one parameter change.
Our Findings... Most Common Programming Change

FREQUENCY OF INDIVIDUAL PACING PARAMETER CHANGES MADE BY CARDIAC PHYSIOLOGIST AT FIRST CONTACT (N=181)

- **Output**: 40%
- **Sensitivities**: 24%
- **Mode**: 15%
- **Rate**: 13%
- **AV Delay**: 6%
- **Other**: 2%
Reasons for Programming Change

- Safety margin not met: 47%
- Loss of capture: 16%
- Undersensing: 21%
- Oversensing: 4%
- Rate: 5%
- Mode: 12%
- Other: 2%
Time Until First Contact with Physiologist

The average waiting duration for the first point of contact with the cardiac physiologist was 19 hours 57 minutes 47 seconds (± 7 hours 46 minutes 21 seconds).
Conclusion

- At first physiologist contact, 43% of patients had inappropriate device programming settings.
- Results suggest earlier engagement with cardiac physiologist may be of benefit and that device optimisation should occur either within the operating theatre or earlier into ITU admission.
  - Further prospective work being planned to assess clinical benefits of device optimisation.
Thank you...

Any questions?