Pacing troubleshooting

NASPE training
Lancashire & South Cumbria Cardiac Network
Pacing stimulus present – failure to capture

- Lead dislodgement
  - Early – unstable position
  - Late – twiddlers syndrome

- Abnormal ECG
- Abnormal X-ray
- Normal impedance
- Elevated threshold

- Reposition lead
Lead dislodgement – extra notes

- Change in pacing morphology/chamber if capture is seen
- Ensure current of injury is seen – correlation poor injury pattern to lead dislodgement
- Check suture sleeve site at re-op
- Thrombus may have developed around tip, encasing tines/helix and preventing adequate fixation at reposition
- Twiddlers syndrome – replace rather than reposition (sub pectoral placement)
Pacing stimulus present – failure to capture

- Lead maturation
  - Early – inflammatory response
  - Late – progressive fibrosis

- Normal ECG, X-ray, impedance
- Elevated threshold

- Increase output, trial steroids, reposition/replace lead
Lead maturation – extra notes

- Inflammatory reaction causes lead to displace slightly from myocardium
- If excessive – failure to capture, termed exit block – higher chance if high thresholds seen at implant, incidence <5%
- Incidence lower, steroid eluting leads
- Temp wire – until threshold falls if pacemaker dependant
- Systematic steroids (effective 50% patients high thresholds post implant) 60mg prednisone/day – adults and 1mg/kg – pediatrics
- Check 5 days later, if no change = ineffective and if lower continue steroids for 1 month
Pacing stimulus present – failure to capture

- Late high thresholds
  - Progressive fibrosis, MI, Cardiomyopathy, Drugs/metabolic changes, Damaged lead

- Normal ECG, X-ray, impedance
- Elevated threshold

- Increase output, correct cause, replace lead
Lead maturation – extra notes

- Chronic lead – will not respond to steroids
- Hyperkaleamia, acidemia
- Drugs
- Progressive fibrosis/MI/Myopathy – new lead
- Caution – lead problem seen intermittently on telemetry, telemetry error
Pacing stimulus present – failure to capture

- Insulation failure
  - Suture sleeve, clavicular crush (medial subclavicular musculotendinous complex!!)

- Normal ECG, X-ray (possible to see conductor deformity)
- Decreased impedance
- Elevated threshold (due to shunting of stimulus away from myocardium)

- Reprogram to unipolar, replace lead
Insulation failure – extra notes

- Depends on location
- Unipolar or proximal portion bipolar – extracardiac pectoral stimulation
  - Insulation failure
  - Up side down pacemaker
  - Failure of Insulation on pacemaker
- Change pacemaker stimulus amplitude (analog ECG recorder)
  - Smaller pulse – shorter path between conductor & pacemaker – unipolar, failure inner insulation - bipolar
  - Larger stimulus – unipolarised signal of bipolar lead (outer insulation failure)
Pacing stimulus present – failure to capture

- Open circuit
  - Conductor fracture
  - Failure to tighten set screw

- ECG Normal
- X-Ray abnormal
- Impedance increased
- Threshold elevated

- Reprogram – unipolar, replace lead tighten screw
Open circuit – extra notes

- Total open circuit – no stimulus
- Incomplete circuit (2 ends meet) – stimulus with no capture (due to increased impedance)
- Or = air trapped in pocket of unipolar system where a previously large pacemaker has been replaced with small size device
- Partially open circuit – oversensing – noise created by make-break contact
- Easy to see in unipolar, difficult in co-axial bipolar as the intact conductor may mask the fracture
Pacing stimulus present – failure to capture

- Battery depletion
- Functional non-capture
  - Pseudofusion
- ECG, X-Ray, Impedances normal
- Threshold – elevated
- Replace pacer (depletion)
- Reprogram rate, refractory, sensitivity
Pacing stimulus present – failure to sense

- Lead dislodgement
  - Early – unstable position
  - Late – twiddlers syndrome
- Low amplitude EGM
  - Small P/R waves at implant
  - Different activation pattern (AF, PAC, BBB, PVC etc)
  - Medication change
  - Electrolytes
  - MI/Cardiomyopathy
  - Tissue fibrosis, lead maturation
Pacing stimulus present – failure to sense

- Insulation failure
- Functional undersensing
  - Magnet
  - Noise reversion mode
  - ERI
  - PMT
  - Mode switch
  - Upper rate behaviour
- Inappropriate programming
Pacing stimulus absent

- Oversensing
  - Cardiac signal
  - Myopotential/diaphragm
  - Pacing afterpotential
  - EMI
  - Cross talk
  - Make-break signals
Pacing stimulus absent

- Open circuit
  - Conductor break
  - Loose set screw
  - Air in pocket
  - Lead/pacemaker connector mismatch
Pacing stimulus absent

- Internal insulation failure
- Component malfunction/EOL – magnet application reveals no output
- Pseudo malfunction
  - Hysteresis
  - Rate smoothing
  - Mode switch
  - PMT
  - AV search hysteresis