Best Perioperative Care for AAA Patients

NCEPOD Report
Regents Park College, London

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Royal College of Surgeons in Ireland

10/2/2009
NCEPOD - Changing Medical Practice

- NCEPOD 2001 - Changing the Way We Operate
- NCEPOD 2002 - Functioning as a Team
- NCEPOD 2003 - Who Operates When
- NCEPOD 2004 - Scoping our Practice
- NCEPOD 2005 - An Acute Problem (Medical Admissions into Intensive Care)

10/2/2009
Abdominal Aortic Aneurysm: A Service in Need of Surgery

- Vascular Society of Great Britain and Ireland (VSGBI)
- Vascular Anaesthesia Society of Great Britain and Ireland (VASGBI)
- Royal College of Radiologists

10/2/2009
• Conventional wisdom
  UK outcome studies
  Best practice

• NCEPOD
  Anaesthesia findings

• Limitations of study

• Recommendations
  Personal reflections

Presentation

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Outcome Following AAA Repair

- **Patient factors**
  - Age

- **Co-existing disease states**
  - Cardiac
  - Respiratory
  - Renal

- **Surgical factors**
  - Elective/Urgent/Rupture
  - AOD vs. AAA
  - Open vs. endovascular repair

- **Institution case load**

  10/2/2009
Global Haemodynamic Responses to Abdominal Aortic Cross Clamp

Gelman S: Anesthesiology 1995; 82: 1026-60

- Afterload increased
  - Arterial pressure  SVR
  - LVESWS
- Preload Blood volume redistribution
  - CVP/PCWP
- Heart rate
- Myocardial contractility
Factors Affecting Haemodynamic Changes

- **Pre-existing**
  - Blood volume
  - Coronary blood flow
  - LV function

- **Surgical**
  - Site
  - Duration
  - Metabolic
  - Humeral

  *Anaesthetic technique*
**Global Haemodynamic Responses to Abdominal Aortic Unclamp**

- Reactive hyperaemia
- Decreased arterial pressure
- Decreased systemic vascular resistance
- Decreased left ventricular end-diastolic pressure
- Cardiac output

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A 21-year Experience of Abdominal Aortic Aneurysm Operations in Edinburgh

Bradbury AW, Adam DJ, Makhoomi KR et al:

- Infrarenal AAA
- Prospective
- 1976-96
- 1515 patients
- 492 elective asymptomatic
- 194 elective symptomatic
- 156 emerg non-ruptured
- 673 ruptured
A 21-year Experience of Abdominal Aortic Aneurysm Operations in Edinburgh

Bradbury AW, Adam DJ, Makhoomi KR et al:

30 day mortality

- Elective - 6.1%
- Elective asympt - 5.8%
- Emerg asympt - 14.1%
- Ruptured - 37%
- Increased operative mortality
- Increased patient age
- Increased coexisting disease

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Risk Factors for Postoperative Death Following Elective Surgical Repair of Abdominal Aortic Aneurysm: Results from the UK Small Aneurysm Trial

- MRC Clinical Trials Unit
- Identification of preoperative risk factors
- Elective infra-renal AAA
- 820 patients
- 30 day mortality - 5.6%
- Mortality related to
  - Age
  - Renal impairment - increased s. creatinine
  - Lung disease - reduced FEV-1
NCEPOD 2005 - Abdominal Aortic Aneurysm: A Service in Need of Surgery

• Population
  Adults
  AAA repair
  Elective/emergency
  Open/endovascular

• Hospitals
  England
  Wales
  Northern Ireland

• Data Collection
  2 months - February / March 2004

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Anaesthesia

• Preoperative Management
  - Beta blockade
  - Statins
  - Investigations

• Intraoperative Personnel
  - Grade
  - VASGBI

Management
  - Blood loss
  - Monitoring
  - Vasopressors

• Postoperative
  - EAA
  - Destination
NCEPOD AAA - Findings

Total number of cases
884

Operative
805 (91%)

Palliative
79 (9%)

Endovascular
53 (7%)

Open Procedures
752 (93%)

Emergenc y
264 (35%)

Elective
434 (58%)

Unknown
54 (7%)

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Improved Long-term Survival

• Preoperative assessment
  - optimization of medical therapy

• Modification of anaesthetic technique
  - EAA
  - monitoring into postoperative period

• Prophylactic therapy
  - sympatholytic effects - alpha 2 agonists
  - vasodilators - nitrates / calcium channel entry blockers
  - Control of heart rate - beta blockers
• Lipid lowering - statins

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• Preoperative Drug Therapy

Beta Blockers
PROPHYLACTIC ATENOLOL REDUCES POSTOPERATIVE MYOCARDIAL ISCHEMIA.

McSPI Research Group

Arthur Wallace, Beth Layug, Ida Tateo, Juliet Li, Milton Hollenberg, Warren Browner, Denis Mangano

Multicenter Study of Preioperative Ischemia Research Group

10/2/2009
Prophylactic Atenolol reduces postoperative myocardial ischaemia

Wallace A. et al (McSpi Research Group)
Anesthesiology 1998; 88: 7 - 17.

- 200 patients
- elective non cardiac surgery
- coronary artery disease / > 2 risk factors
- Atenolol
  - 5 - 10 mg IV pre op
  - 50 - 100 mg PO post op
- placebo x 7 days
Atenolol and Cardiovascular Morbidity
(Mangano NEJM 1996: 335: 1713-20)
Cardiac event rates

Days 180 | Days 360 | Days 540 | Days 720
---|---|---|---
Atenolol | | | |
Placebo | | | |
PROPHYLACTIC ATENOLOL REDUCES POSTOPERATIVE MYOCARDIAL ISCHEMIA.

- Patients only followed after discharge
- 4 deaths in hospital group
- 8 patients in placebo group on beta blockers - discontinued
- Placebo group - more severe cardiac disease
- 40% did not tolerate dose

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The Effect of Bisoprolol on Perioperative Mortality and Myocardial Infarction in High-Risk Patients Undergoing Vascular Surgery

Don Poldermans, Eric Boersma, Ian R Thompson et al and the Dutch Echocardiographic Cardiac Risk Evaluation Applying Stress Echocardiography Study

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Study Design

- Prospective 1996-9
- 7 centres
- Elective abdominal aortic or infrainguinal arterial reconstruction
- Clinical risk evaluation
- Dobutamine echocardiography
- Randomized standard perioperative care
- Standard perioperative care + bisoprolol 5 mg oral -1 week
- Heart rate > 60 bpm
- Postoperative 30 days
- 12 lead ECG and CK-MB
Mean Heart Rate

Before Day 1
Day 3
Day 7

Standard
St + bisoprolol

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Figure 1. Kaplan–Meier Estimates of the Cumulative Percentages of Patients Who Died of Cardiac Causes or Had a Nonfatal Myocardial Infarction during the Perioperative Period. I bars indicate standard errors. The difference between groups was significant (P<0.001 by the log-rank test).
The Effect of Bisoprolol on Perioperative Mortality and Myocardial Infarction in High-Risk Patients Undergoing Vascular Surgery

- Non blinded
- Highly selected patient population
- Trial terminated early
- High complication rate in placebo
- 80-90% treatment effect - unrealistic?
Preoperative Drug Therapy

• Beta blockade

Elective
  Yes - 35%
  No - 65%

Emergency
  Yes - 26%
  No - 74%

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Abdominal Aortic Aneurysm: A Service in Need of Surgery

- Preoperative Drug Therapy

Statins
Reduction in Cardiovascular Events after Vascular Surgery with Atorvastatin: A Randomized Trial

Anai E Durazzo, Fabio Machado, Dimas T Ikeoka


Lipid - Lowering Therapy and In - Hospital Mortality following Major Noncardiac Surgery

Peter K Lindenauer, Penelope Pekow, Kaijun Wang

JAMA 2004; 291: 2092-2099

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Perioperative Drug Therapy

- Statins

  Elective
  - Yes: 53%
  - No: 47%

  Emergency
  - Yes: 31%
  - No: 69%

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Investigations

- Standard
  - History
  - Physical examination
  - Chest X ray
  - ECG

- Transthoracic echocardiography
  - 60%

- Cardiology review
  - 22%

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Intraoperative Factors

- Blood
  20% preoperative autologous blood donation

- Cell Saver
  55%
  Intraoperative salvage
Epidural Anaesthesia

- Elective AAA - 92%
- Emergency - 73%
- ASA therapy - 38%
- Fractionated heparin < 12 hours - 14%

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Anaesthetists

- Consultant at start elective open AAA - 93%
- Emergency - 85%
- Audit - 49% no IT or logbook
- < 5 / year - 22% elective
- < 5 / year - 61% emergency
Postoperative

Destination
- Level 3 - ICU - 56%
- Level 2 HDU - 33%
- Recovery - 9%

Ventilated
- Elective - 42%
- Emergency - 78%

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NCEPOD 2005 - Abdominal Aortic Aneurysm: A Service in Need of Surgery?

Limitations

- Denominator uncertain
- Non contributors 38 - 226 hospitals
- Incomplete data return
- Retrospective
- Descriptive statistical analysis
- No statistical hypothesis testing
NCEPOD 2005 -

Abdominal Aortic Aneurysm: A Service in Need of Surgery?

Recommendations

- **Service provision**
  - Equal priority - diagnosis/investigations/treatment
  - Major elective surgery - all elements in place
  - Concentration in fewer hospitals

- **Preoperative care**
  - Appropriate grades for preoperative assessment clinics
  - More Level 2 HDU beds - less ICU bed needs and cancellations

- **Postoperative care**
  - Elective surgery - level 2 HDU
  - Care of epidural catheters - documentation

- **Department organization**
  - Logbook IT - audit and appraisal

10/2/2009 Review list allocation - higher volume elective/emergency
Mortality rates

Elective open AAA repair - 6.2%
Emergency - 36%
Preoperative care

Appropriate grades for preoperative assessment clinics

More Level 2 HDU beds - less ICU bed needs and cancellations

Patient preparation

10/2/2009
B-adrenergic -Blocking Drugs. (Editorial)
Incredibly Useful, Incredibly Undereutilized
Anesthesiology 1998; 88:2-4

- Attenuates endogenous sympathetic activity
- Decreases heart rate
- Improves myocardial O₂ supply/demand
- Redistribution of myocardial blood flow
- Increases subendocardial perfusion
- Anti-ischaemic properties
- Misrepresentation risk/benefit
- Bradycardia
- Conduction defects
- Reactive airways
- Peripheral vascular disease

10/2/2009
How strong is the evidence for the use of perioperative B blockers in non-cardiac surgery? Systemic review and meta-analysis of randomised controlled trials.

PJ Devereaux, W Scott Beattie, Peter T-L Choi

BMJ 2005

<table>
<thead>
<tr>
<th>Study or sub-category</th>
<th>(\beta) blocker (n/N)</th>
<th>Control (n/N)</th>
<th>Relative risk (99% CI)</th>
<th>Weight (%)</th>
<th>Relative risk (99% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jakobsen 1997(^{30})</td>
<td>1/18</td>
<td>0/18</td>
<td>5.29 3.00 (0.05 to 185.13)</td>
<td>16.38</td>
<td>0.61 (0.10 to 3.88)</td>
</tr>
<tr>
<td>Wallace(^{31})</td>
<td>3/99</td>
<td>5/101</td>
<td>12.74 0.68 (0.07 to 6.74)</td>
<td>16.27</td>
<td>0.10 (0.02 to 0.64)</td>
</tr>
<tr>
<td>Bayliff(^{32})</td>
<td>2/49</td>
<td>3/50</td>
<td>16.27 0.10 (0.02 to 0.64)</td>
<td>3.56</td>
<td>0.25 (0.00 to 14.93)</td>
</tr>
<tr>
<td>Poldermans(^{33})</td>
<td>2/59</td>
<td>18/53</td>
<td>5.98 0.07 (0.00 to 3.15)</td>
<td>9.08</td>
<td>0.33 (0.02 to 6.29)</td>
</tr>
<tr>
<td>Raby(^{34})</td>
<td>0/15</td>
<td>1/11</td>
<td>28.90 0.88 (0.41 to 1.90)</td>
<td>28.90</td>
<td>0.44 (0.16 to 1.24)</td>
</tr>
<tr>
<td>Zaugg(^{35})</td>
<td>0/43</td>
<td>3/20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban(^{36})</td>
<td>1/60</td>
<td>3/60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yang(^{37})</td>
<td>19/246</td>
<td>22/250</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>589</strong></td>
<td><strong>563</strong></td>
<td></td>
<td><strong>100.00</strong></td>
<td><strong>0.44 (0.16 to 1.24)</strong></td>
</tr>
</tbody>
</table>

Total events: 28 (\(\beta\) blocker), 55 (control)

Test for heterogeneity: \(\chi^2=12.07, \text{df}=7, P=0.10, I^2=42.0\%\)

Test for overall effect: \(z=2.05, P=0.04\)

**Fig 3** Relative risks for major perioperative cardiovascular events (cardiovascular death, non-fatal myocardial infarction, or non-fatal cardiac arrest)
How strong is the evidence for the use of perioperative B blockers in non-cardiac surgery? Systemic review and meta-analysis of randomised controlled trials.

PJ Devereaux, W Scott Beattie, Peter T-L Choi

BMJ 2005

• “The evidence that perioperative B blockers reduce major cardiovascular events is encouraging but too unreliable to allow definitive conclusions to be drawn”
Statins decrease perioperative cardiac complications in patients undergoing noncardiac vascular surgery.

Kristin o’Neil- Callahan, George Katsimaglis, Michah Tepper

J Am Coll Cardiol 2005; 45: 336-42

• “Use of statins was highly protective (9.9% vs 16.5% controls) against perioperative cardiac complications in this retrospective study of 1,163 patients.”
Effect of Clonidine on Cardiovascular Morbidity and Mortality after Noncardiac Surgery

Arthur Wallace, Daniel Galindez, Ali Salahieh
Anesthesiology 2004; 101: 284-93

Fig. 1. Survival for clonidine-treated versus placebo-treated patients. Survival curves for 2 yr after surgery for patients treated with clonidine (n = 125) and placebo (n = 65). Clonidine reduced the incidence of death (P = 0.01 by log-rank test and P = 0.01 by Wilcoxon test).
Consolidation and Development of Expertise

- **Preoperative care**
  - Preoperative assessment clinics - patient preparation

  **Service provision**
  - Concentration in fewer hospitals

- **Postoperative care**
  - Elective surgery - level 2 HDU

- **Department organization**
  - Review list allocation - higher volume elective/emergency

10/2/2009